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BMFT PLANS INCREASED SUBSIDIES FOR SUPERCONDUCTOR RESEARCH

Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN in German No 452, 27 Mar 87 pp 6-7

[Text] In the worldwide search for superconductors at the highest possible usable temperatures, the research teams of the Karlsruhe Nuclear Research Center (KfK) working in this field have achieved an important milestone: the beginning of superconductivity--loss-free conductivity of electrical current--was measured for the first time at a temperature of 125 K (-148°Celsius) with an oxide-based alloy of yttrium, barium and copper. Such "high" starting temperatures, in comparison with the usual utilization temperatures for superconductors in today's technology of 4 K (-269°C), open new long-term possibilities for large-scale technical applications.

Superconductivity takes effect with certain materials only below a certain critical temperature and more or less abruptly. All over the world, a search for alloys with as high a transition temperature as possible is occurring in the materials research laboratories of large companies and research institutions. Until now, theoretical physics observed a limit of about 30 K. It is evident that high transition temperatures play a fundamental role in the economics of the technical applications of superconductors because expensive cooling with liquid helium can be replaced with considerably cheaper liquid nitrogen. The theoretical "sound barrier" of a 30 K transition temperature was first crossed by the IBM Zurich research laboratory with a composite of lanthanum, barium, copper and oxygen. At the beginning of 1987, an increase to 93 K was reached by the University of Texas in Houston, in a similar combination in which lanthanum was replaced with yttrium. On 18 March 1987, during the annual conference of the American Physical Society in New York, a few dozen such superconductor composites were presented to about 2,000 participants, including the Karlsruhe Nuclear Research Center's composite with the formula, $Y_1,2B_0,8CuO_4$, which set a clear record with the first observance of superconductivity at 125 K.

Many new, more cost-effective applications for superconductivity can be found on this basis in energy technology (superconducting generators, transformers and memories as well as nuclear fusion), high performance computers, medical technology (nuclear spin tomography, SQUID's [Superconducting Quantum Interference Device]), measurement techniques (highly accurate standards, high frequency measurement techniques), accelerator technology and so on. However,

as Parliamentary Undersecretary Dr Albert Probst said in response to a question from Federal Deputy Ludwig Gerstein concerning research results in the superconductor field, the materials currently under examination are not yet suitable for magnet construction and no breakthrough in energy technology at the present R&D stage is expected.

For many years, the Federal Ministry for Research and Technology [BMFT] has been funding further superconductor development under the "physics technologies" subsidy priority. As soon as the new results became known, the BMFT intensified its measures in the short term within the framework of available budget funding. At the moment, the BMFT is investigating the situation very carefully with the objective of translating the new physics knowledge into a new technology with as many applications as possible, along with the VDI Technology Center in Duesseldorf, the organization responsible for carrying out the physics technologies priority subsidy project.

8702
CSO: 3698/M243

FRG:DFVLR STUDIES TITANIUM ALLOY, SUPERPLASTICITY

Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German
16 Apr 87 p 8

[Article: "Superplasticity Improves the Shaping of Titanium Alloys--The DFVLR Investigates High-Temperature Characteristics and Combination With Diffusion Welding"]

[Text] Titanium and titanium alloys have for around 30 years been employed as structural materials. It is not surprising that aeronautic and astronautic research has played a special role in this development. These materials have particular importance because of their high specific strength and in terms of their ratio of strength to specific weight. In the case of titanium the weight is only half that of steel. Also their outstanding corrosion resistance and good high-temperature characteristics make these materials interesting.

In aircraft construction these materials are principally employed in gas turbines, 20 to 30 percent of whose structures consist of titanium alloys in modern power plants. Typical components here are the compressor element, housing, and blades. The corresponding maximum operational temperatures are from 500° to 550° C. But titanium alloys are also finding increasing use in components which are subject to high mechanical stresses such as power plant suspensions and power plant bulkheads.

Future developments will aim at still higher strength and toughness through improvements in these alloys. In addition, through further improvement in high-temperature characteristics of titanium alloys there will be replacement of the twice as heavy nickel-based alloys used up to now in power plants. A third trend to be watched depends directly upon the relatively high cost of titanium materials because this high cost has frequently operated as a serious obstacle to the rapid spread of the employment of titanium alloys. Thus cost considerations are coming more and more into the foreground in alloy development. Expensive alloy constituents are being replaced by cheaper ones. Also the development of cheaper methods of producing titanium are being pushed.

Greatest interest attaches to new shaping procedures such as "net shape" technology. In this procedure a structural component is manufactured in as few manufacturing steps as possible and with minimal material loss in such a way

as to approximate its final contour as closely as possible. This procedure includes casting, powder metallurgy, isothermal forging, hot isostatic pressing, as well as superplastic forming.

The term "superplasticity" is understood to mean the property of a metallic material by which under certain conditions it is capable of shaping through plastic flow like that which is already familiar, for example, in the case of plastics or glasses. It is a characteristic feature of superplasticity that the material deforms not locally, but homogeneously over the entire cross section. Superplasticity occurs only when the deformation temperature is about half that of the melting temperature and when relatively low shaping speeds are maintained.

There are also specific prerequisites relating to the microstructure of the material, to its texture. In this connection it is necessary to know that plastic deformations at high temperature take place in a manner which is different from that of low temperatures. Thus at room temperature titanium alloys deform primarily through displacements taking place on closely adjacent shear planes within the grain interior. But at high temperatures the deformation mechanism changes into an almost pure sliding process at the grain boundaries themselves. Correspondingly there is also a change in fracture behavior from transcrystalline to intercrystalline.

According to statements by Dr Manfred Peters of the Institute for Materials Research of the German Research and Testing Institute for Aeronautics and Astronautics (DFVLR) in Cologne-Porz the fact that grain boundaries at high temperatures constitute the weak spots of a structural component is well known and is not the least of the reasons for developing turbine blade systems out of monocrystals. But for superplastic forming it is precisely the opposite conditions which are required, namely a very high density of such "weak spots" in order to achieve large plastic deformations. In general one may say that metallic materials should have a grain size of less than 15 to 20 µm if they are to exhibit superplastic properties. In addition, the grain size should not enlarge significantly during the shaping process.

For the titanium alloy Ti-6Al-4V which is in most common use these requirements are in fact: in the forged or rolled state the grain size of the alpha phase is somewhere between 10 and 20 µm. In addition, the existence of a second phase (beta phase) has the effect that the grain growth during shaping is sharply limited. Thus with this alloy at temperatures between 900° and 950° C and strain rates of about 1 percent per minute it is possible to get plastic deformations of much above 1,000 percent. By way of comparison: at room temperature this alloy seldom achieves strains above 20 percent.

The superelasticity phenomenon has already been known for around 50 years. It is true that for a long time it was only regarded as a curiosity of materials science. It is only recently that there have been efforts to make this phenomenon useful and to develop it in combination with diffusion welding into a new inexpensive manufacturing process. The process may be described in terms of a sandwich-structure component such as that employed as a power plant bulkhead: thus three titanium sheets are placed between the upper portion and lower portion of a heated form.

After having reached the required shaping temperature the sheets are slowly pressed against the form wall by means of an overpressure such as may be produced, for example, through argon inflation or through underpressure by evacuating the form. At the locations where the titanium sheets have direct contact they are welded together by diffusion in consequence of the high pressure and the high temperature. As the example shows the diffusion welding can be suppressed in a controlled manner through the intervention of separating materials consisting of yttrium oxide or boron nitride.

For a multitude of components it has already been possible to demonstrate the economic effectiveness of this process. This is especially the case whenever one is dealing here with parts having complicated shapes and consisting of expensive materials which are manufactured only in small to moderate-size batches. The DFVLR has made a contribution to improving the economy of this process. Through controlled thermomechanical treatment of a Ti-6Al-4V alloy it has been possible to reduce the grain size by almost one order of magnitude and to optimize the crystal orientation (texture). As investigations have shown it is possible in this way either to reduce the required pressures by as much as a third or to diminish the forming temperatures by a good 100° C.

8008
CSO: 3698/481

BRIEF

PHILIPS RESEARCHES SUPERCONDUCTIVITY--The Philips Research Laboratories intend to carry out research intensively in the future in the area of superconductivity effects at high temperatures. One of the project groups involved in this will include 20 to 25 scientists from Eindhoven, Aachen, and Briarcliff Manor (United States). According to reports it has been possible in the Eindhoven Philips Laboratories in early April to demonstrate for the first time superconduction at about 90° K (-183° C) with a mixture of yttrium, barium, and copper oxides. [Text] [Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 27 Apr 87 p 8] 8008

CSO: 3698/481

USSR WOOS CUSTOMERS FOR SATELLITE LAUNCHES, TRANSPORT

Duesseldorf HANDELSBLATT in German 25 May 87 p 15

[Article: "Soviets Repeat Offer for Satellite Launches and Transport. New Offers to Interested Western Parties"]

[Text] Geneva, 23/24 May 87--The Soviet Union alone accounted for 121 or 87 percent of the total of 139 satellite launches in 1986. The Americans launched 8 objects into space, the French and Japanese 4 each, the Chinese 2.

This emerges from the just published statistics of the International Telecommunications Union in Geneva. Accordingly, the Soviet Union now wishes to commercially exploit its superior position in space, the president of the Soviet space authority "Glavcosmos" announced in Geneva.

Glavcosmos President A. Dunayev made concrete "cheap offers" for space transport and insurance to a group of Western businessmen in Geneva. He explained that more than two dozen satellites were currently waiting to be launched, some of them urgently. In order to "clear up this waiting line, and despite the limited leeway in its own space projects, the Soviet Union would make its rocket models available, including--at a later time--its newest model of the 100-ton payload class. In spite of the "very interesting" offers, however, no deals have yet been made with the interested foreign parties--currently some 25, including Intelsat--because of "American obstructions."

To protect the security needs of interested foreign parties, he offered continuous escort and surveillance of the foreign satellites by their owners up until the launch. He suggested transport by Aeroflot charter planes to the Soviet Kosmodrom. Neither the satellites nor the test instruments would be subject to Soviet customs inspection of any sort. "The client is allowed to permanently escort the transport and to guard it around the clock." As a sample price, he gave $36 million for launching a 20-ton satellite into geo-stationary orbit. For transporting a satellite of up to 7 tons into a simple orbit about the earth, the Soviet Union would ask between $10 and $14 million. The price could vary from client to client. For tasks of this sort, his organization would make Sojus, Wostock and Molniya rockets available. All the launchings could be issued in the Soviet Union for a 12-percent premium. In case of accident, the Soviet Union would offer "money back" or a replacement launch.

12507/12851
CSO: 3698/538

USSR SATELLITES INTEREST FINNISH FIRMS

Helsinki UUSI SUOMI in Finnish 15 May 87 p 37

[Text] Negotiations concerning the lease of a Soviet communications satellite by Finnish firms will be continued in connection with the Soviet National Exhibition opening in Helsinki today.

The USSR's trade representative V.D. Pugin said Thursday in Helsinki that, during the next few weeks, three Finnish firms will be negotiating for the use of a Soviet satellite for data communications.

Pugin mentioned the satellite lease as being another form of a Finnish-Soviet joint project. In addition to Finland all of the other Nordic countries will also be considered as partners, said Pugin.

New Visions

Trade representative Pugin considered the peaceful use of space technology and Finnish-Soviet joint ventures in space to be promising fields. It is possible that Finland could begin to join the USSR in jointly constructing spacecraft.

The speeding up of license sales would also interest the USSR, said Pugin. The USSR's poor job of informing the public as well as the passive reaction of the Finns have kept license sales small up until now, Pugin said disapprovingly.

But positive results can also be found. Huhtamaki's purchase of a permit to import champagne is a good example, Pugin points out.

The USSR National Exhibition is scheduled to open today at Pasila's Exhibition Center.

The exhibition will show machining apparatus, space technology, personal computers, cars, welding apparatus, agricultural machinery, airplanes, medical instruments, etc. One of the drawing cards is two-time space flight veteran, cosmonaut Alexander Ivanchenkov.

13002/12951
CSO: 3698/499

NEW CEO TO DIRECT SNECMA'S STRATEGY

Paris L'USINE NOUVELLE in French 9 Apr 87 p 34

[Article by Jean-Pierre Casamayou: "Bernard Capillon: a Pilot at SNECMA"; first paragraph is L'USINE NOUVELLE introduction]

[Text] His knowledge of national and international aeronautics circles will help him strategically conduct the battle of military engines and develop European cooperation. His objective is to reassure and to take charge.

"I have always lived by the rule of appointing the best qualified person and have never regretted doing so." Thus Andre Giraud, minister of defense, briefly comments on his decision to name General Bernard Capillon, 57, to the head of SNECMA [National Company for Aircraft Engine Studies and Construction]. The apppointment is far from receiving unanimous support within the company. Many criticize the former Air Force Chief of Staff for his lack of manufacturing experience.

Trade Unions and management alike do not hide their concern that existing teams will be disrupted. They clearly would have preferred the continuity of an appointment of Jean Sollier, current head of the SEP [European Propulsion Company], who is also assistant general manager at SNECMA and almost semi-official heir to Jacques Benichou, the outgoing CEO. Nevertheless, the history of manufacturing shows that "new blood, no matter how unwelcome, can sometimes give an organization new life. We should remember Aerospatiale's spectacular recovery under General Jacques Mitterand, a pilot and senior officer like Bernard Capillon.

Bernard Capillon's first task will be to reassure and to show that a general can be a good...captain of industry. His assets? Intellectual and personal qualities which have allowed him to enjoy an exceptional military career (at 52 he was the youngest of the Chiefs of Staff) and familiarity with the national and international aeronautics circles.

With 6,000 flying hours, the new CEO has lived the entire history of SNECMA's military jet engines, from the Atar 101 to M-53. He knows their strengths (and also their weaknesses...) better than anyone. In addition, his personal contacts made while at the American War College or in his official travels will prove invaluable for "internationalizing" SNECMA's military activities.

Now, with this division in trouble due to slow Mirage sales--only seven or eight M-53's are produced monthly--the French engine manufacturer needs to diversify its customers so as not to depend almost exclusively, in this field, on Dassault. To do so, it will count on a new engine, the M-88, whose "hot section part" is the most powerful in the world. With a thrust of between 7.5 tons (for the future Rafale fighter plane) and 10.5 tons (for a single engine craft), this jet engine meets the needs of India, Yugoslavia, and Brazil for their planes under development.

However, direct sales are not SNECMA's only objective. It is ready to involve European manufacturers, up to 50 percent, in the M-88 program. The success of its experience with General Electric has taught SNECMA the virtues of cooperation. With 3,012 CFM-56 engines already on order, the project is far from over. Before leaving post, former President Jacques Benichou announced the latest estimates: "Final sales figures for the CFM-56 will be between 5,000 and 6,000." The result: the unprecedented production rate of 50 engines a month and a full order book for a long time to come. Not only for the company itself, but also for its 4,000 subcontractors and suppliers.

Another successful program is the CF-680 jet engine, in which SNECMA has a 10-percent share. In 1986 it had already brought in Fr 1.4 billion in orders. As for the future, SNECMA is well prepared with a 35-percent share in the futuristic UDF (Unducted Fan) project, the high speed unducted fan jet engine. Bernard Capillon will not have to worry insofar as civilian jet engines are concerned!

With the General Electric cooperation in the civilian field and the M-88 engine in the military, the major strategic choices have been made. What is left is to tighten up the company's management in an environment of unavoidable austerity. Because in spite of an 11-percent increase in turnover to 10.25 billion and gains in productivity (up 60 percent in 5 years), profits have dropped by almost 40 percent (Fr 46 million). The reason? Variations in the franc/dollar exchange rate. When 80 percent of production is exported, the effects of currency fluctuations are felt.

The new CEO knows that he has no choice but to keep trying to cut expenses and operating costs. It is a task worthy of the man who successfully led the Air Force during the past 4 years of budget restraints, closing three air bases in the process. That is what the army calls "tightening your belt."

25051
CSO: 3698/A223

DESCRIPTION OF HM60 ENGINE FOR ARIANE 5

Stuttgart FLUG REVUE in German Apr 87 p 50

[Article by Hans Forster: "HM60--The Engine for the Ariane 5: The Critical Point"]

[Text] With HM60, a hydrogen-oxygen propulsion unit that is ignited at launch is to be used for the first time in the history of European space travel. The central stage engine of the Ariane 5 must then work for more than 8 minutes before it is turned off by the cutoff signal at a height of approximately 150 km. After that, the third stage transports the payload into its target orbit. This dual function--that of ground and high-altitude propulsion unit at the same time--has up to now been carried out only by the main boosters of the U.S. Space Shuttle. The design goal for HM60 is ground thrust of 800 kN and vacuum thrust of 1025 kN.

The DM 1.7 billion program has been in the developmental phase since early 1986, and will continue until the end of 1994. This year, the project enters the "hot phase," the beginning of the first hot-gas experiments for engine components. Thus, it is foreseen that the test phase with the hydrogen turbopump will begin in July. For this, SEP in Vernon is obtaining the new PF52 turbopump testing stand, which permits parallel operation of the hydrogen and the oxygen turbopump. At the same time, a new oxygen testing stand is being developed at MBB's P59 testing shop in Ottobrunn. The first working tests with the oxygen turbopump are planned there for November. Planning for the gas generator is being done parallel, with the beginning of testing in November, also at MBB. Another milestone is planned for October, which could literally become a "golden October" for the developers of the thrust chamber if the first hot-gas tests on the P3.2 at the DFVLR in Lampoldshausen are successful. Europe's biggest thrust chamber testing stand is currently moving along towards completion there.

From the very outset, there has been no particular effort to pursue an advanced developmental direction for the HM60 engine. Instead, an attempt is being made to limit the technical and financial risks by using tested and true processes. Besides the use of the high-energy fuel combination of liquid hydrogen and liquid oxygen (LH2/LOX), the bypass flow principle is also be applied again. In this engine design, the turbine exhaust is emitted parallel to the main flow, the engine's gas jet. In going out into the atmosphere, it

contributes slightly--less than two percent--to overall thrust. A common gas generator provides the oxygen turbopump with 3.2 kg and the hydrogen turbopump with 5.3 kg of hot gas per second, which it generates by burning hydrogen and oxygen at 80 bar and with a mixture ratio of 0.9. The turbopumps for the fuel supply are started up and the gas generators are ignited by a powder charge.

MBB is again developing the central element of the HM60, the thrust chamber. It consists of a universal joint, an injection head, a combustion chamber and a propelling nozzle. Into the combustion chamber, which operates at 100 bar, are delivered 33.7 kg of hydrogen and 198.5 kg of oxygen per second by way of 516 injection elements; this burns at a mixture ratio of 5.9. Before the hydrogen gets to the combustion chamber, it cools the wall of the combustion chamber as a result of its low temperature of 34.5 degrees Kelvin. To this end, the hydrogen is delivered to a distributor ring at the bottom end of the combustion chamber and from there distributed to the 360 cooling channels.

At the top end of the chamber, which is made of a copper alloy new to Europe, the hydrogen is fed to the injection head via a collecting ring. The cooling channels are being produced according to a special MBB process that is also being applied to Shuttle engines. The propelling nozzles are cooled by the "dump cooling" process. For this, five percent of the delivered hydrogen is pumped through 456 cooling tubes that simultaneously constitute the nozzle structure. The flow of coolant from the end of the jet generates less than one percent of overall thrust. With a total length of 3.0 m and a greatest diameter of 1.85 m, the thrust chamber could achieve a total weight of 1150 kg.

12271
CSO: 3698/551

PROBLEMS CONTINUE TO PLAGUE ARIANE THIRD-STAGE ENGINE

Stuttgart FLUG REVUE in German Jun 87 p 31

[Article by Goetz Wange: "No Ariane Launches Before August: One Year Later"; first paragraph is introduction]

[Text] More and more new problems are turning up in the overhaul of the defective third stage of the Ariane carrier rocket. It has not been possible to fill any customer orders for over a year now. Nevertheless, Arianespace's list of orders on hand continues to grow.

The balance sheet is plain to see: 44 satellites have been committed to the European carrier rocket for launch into space in the coming years. The Arianespace marketing company is thus able to note a backlog of orders amounting to around $2.35 billion. There is additional satisfaction in the fact that the customers include companies from outside Europe. Only recently, Telesat Canada signed on to use the European rocket to launch its two new telecommunications satellites, ANIK E1 and ANIK E2 in 1990. The rocket chosen was the Ariane 4, reinforced by four solid-fuel boosters--a generation in the rocket family that has yet to undergo the baptism of fire.

New Ariane 4 Is Also Affected

"The technical performance data, the price and other favorable contractual terms were the main reasons that my company signed the contract with Arianespace," Telesat president Eldon Thompson said in praise. However, these friendly preliminary laurels can scarcely be of consolation to Ariane executives at present. More than one year after the failed launch of flight number 18, a resumption of the launch series is still unthinkable. The repair of the faulty igniter in the third stage continues to present problems. Since not only the present workhorse, the Ariane 3, but also all versions of the Ariane 4 series are to be equipped with this upper stage, the defect has hit a sensitive nerve.

At the end of last year, the technicians at the French propulsion engine company SEP (Societe Europeenne de Propulsion) appeared to be close to a solution. The igniter was thoroughly revamped, whereby the ignition area was enlarged such that two ignition streams instead of one were used. Corresponding jets feed them into the combustion chamber at a 45 degree

angle--and with three times the energy than that of the igniter that caused the failed launch. Then, however, there were delays in the qualification tests at the testing stands in Vernon. This was caused in part by technical problems, and then the sharp winter frost left its mark on the time schedule. It long ago became obvious that the resumption of launches could not be expected in the spring.

Finally, on 10 March, the acceptance tests with the flight unit for the next launch began. Four test runs, in part for calibration of the new system, but also under launch conditions, were successful. Then a new setback: In preparing for the last acceptance test on 25 March, the testing team discovered an operating error in the decompression chamber through which a subsystem of the third-stage engine was overloaded. Human error, a possible consequence of the unusual time pressure imposed on the test engineers working in shifts around the clock.

Management decided to take no risks and not to permit this engine to be used in the next Ariane launch. Substitution began immediately, so that the tests were resumed 2 days later. New interruptions became necessary because increased temperatures turned up at a place in the engine pump. The acceptance tests were once again postponed until this problem was solved. "Under these circumstances, we are now working towards a resumption of launches in August," a spokesman for Arianespace told FLUG REVUE.

Components Are Piling Up in the Rocket Industry

Not an easy situation for the European space industry. On the one hand, every risk must be avoided for the next launch so that confidence in Ariane is not again diminished. On the other hand, the American rocket producers are pushing their way onto the market after the failure of the Space Shuttle. Thus, the U.S. government in April gave a green light to the Atlas Centaur by General Dynamics. The rocket may now be offered to commercial customers, and NASA facilities can be used for launches. The first customer order could be filled as early as 1989. In the coming weeks, McDonnell Douglas and Marin Marietta are expecting similar approval by the authorities for their Delta II and Titan 3, respectively.

In this situation, Ariane executives are not at all happy about the fact that FRG Minister for Post and Telecommunications Schwarz-Schilling has brought a Chinese alternative into the discussions. Schwarz-Schilling had a look at the production and the launch facilities of the Long March rocket and was very impressed. Feelings here calmed down somewhat when he said in an interview, "The Ariane has first priority for postal service satellites as well. However, should problems lead to infeasible delays in the schedule, alternatives should be sought out in time."

The postponement of the next launch is causing additional logistical problems for the European industrial firms involved in the construction of the Ariane. Thus far, Arianespace has not halted the production contracts that have been awarded; since the components are not being delivered, however, they must be warehoused for a longer period of time. In some cases, the special containers, which are primarily intended for transport, are no longer sufficient. For this reason alone, it is to be hoped that it will soon be possible to again give the launch command in Kourou.

12271
CSO: 3698/551

VIEWS ON SPACE PARTNERSHIP, PAYLOAD, ARIANE, COLUMBUS, HERMES

Bonn RHEINISCHE MERKUR in German 8 May 87 p 14

[Article by Michael Globig: "Europe's Space Future Is Uncertain--No Longer Any Room for Freight in the Hermes Space Vehicle"]

[Text] It is almost exactly 1 year ago that for the last time a European Ariane rocket was launched from Kourou in French Guiana: On 30 May 1986 an Ariane 2 with an Intelsat V satellite on board took off according to plan from this South American launching site only to be destroyed by radio command a few minutes later because of a failure in the third-stage rocket engine. Ever since then the experts of the French power plant company SEP in Vernon/Normandy have been working feverishly to correct the now clearly identified source of the trouble.

The third Ariane stage operates with liquid oxygen and liquid hydrogen as propellants. Both liquids are transported into the combustion chamber by means of gas-driven turbopumps and there ignited. This ignition evidently did not take place rapidly enough; in particular, the very-low-temperature liquid hydrogen "stagnated" in the pump and there became warm enough to vaporize. In consequence, the pump no longer propelled liquid, but only small quantities of gas incapable of feeding the power plant.

A newly developed more efficient ignition unit is expected to assure in future that the combustion of hydrogen and oxygen shall be initiated almost instantaneously. But even this new system appears to have its problems. Sometime in the middle of March a test power plant which had already passed almost all of its trial runs experienced a failure which rendered it unusable and it was necessary to replace it with another rocket engine of the same series. This latter engine must now go through the entire testing program all over again.

Thus in recent days there has had to be another postponement of the 19th Ariane launch (of the 18 preceding ones 14 were successful). At the celebration of the 25th anniversary of the existence of the French space agency CNES it has been acknowledged that the end of June launching date must now be replaced by a date in August.

Such delays put business operations with the Ariane rocket into serious disarray. Through the period up to 1990 as many as 44 rockets are on the waiting

list of this European propulsion system. The last of these was for a commercial service company "Arianespace" which has a contract with Canada to transport two communications satellites. It was intended that in 1987 nine satellites would be placed in space in the course of five launches. According to the new schedules one can now count on only three Ariane launches this year so that at least three of the expected satellites will have to be shifted on the waiting list.

The power plant problems could also have an effect upon testing of the next European rocket model--that is to say, on the especially high-performance Ariane 4 which has a 4.2-ton transport capability. According to plans up to now it has been expected to pass its first flight test in September 1987 and then in the course of time replace the previous Ariane versions 1 through 3 (the components of the last 10 examples of these models are being manufactured by the French "Aerospatiale" Co. located in Les Mureaux). Thus Ariane 4 is expected to be the future workhorse of European astronautic technology.

But Europe does not aim only at launching satellites--European and foreign. It is also striving after higher goals: namely, its own contribution to manned spaceflight. In this it receives support from, among others, the German foreign minister Hans-Dietrich Genscher who has committed himself to the achievement of West European "independent capabilities in manned space travel."

Between Partnership and Leadership Role

And likewise the chief of the European space organization ESA, the German physicist Reimar Luest, urges that the important tasks of space utilization should not be left solely to the superpowers. Autonomy in this respect should not be sought simply for competitive reasons, but also in order that Europe should become an equal partner of those nations which have up to now been active in astronautics. The new head of the German Research and Testing Institute for Aeronautics and Astronautics, Prof Walter Koelle, carries his hopes even a step further: He wants the FRG to assume a leading role in international astronautics.

When the U.S. President Reagan announced the development of a permanent space station as the next goal of American space policy and called upon his European allies to cooperate in this effort the FRG and Italy suggested their jointly conceived Columbus design as a participating model in such a program. This unit would consist of a laboratory, a supply station, and an instrument platform. The laboratory would contain a pressurized chamber--similar to the European space laboratory Spacelab--and would not only operate in free flight but would be also capable of docking with the U.S. space station.

The French agreed to this proposal with the condition that the European space plans should also include the space glider Hermes which they are now planning. The latter would transport astronauts and equipment to the space station and back. The development of an entirely new rocket is being planned as a launching vehicle for this reusable ferry. This launching vehicle would be the Ariane 5 having a 17-ton transport capability.

For each of these three projects--Ariane 5, Columbus, Hermes--cost figures must be set at around 7 billion marks. Launch dates have been named of early 1995 for the Ariane 5 and early 1997 for Hermes. In the autumn when the definition phases of the projects have been completed an EEC ministerial conference will determine whether and with which participants the project will be carried out. The FRG Government has reserved the right to delay until that autumn date its decision as to what projects it will participate in and what fraction of the cost it will assume. Just as the bad launch of the Ariane in May of last year put into turmoil the programming of European transport rockets, likewise the tragic disaster of the American space shuttle Challenger in January 1986 has had an effect upon future European space projects. For example, the space glider Hermes which originally would have been capable of transporting a useful load of 4 tons in addition to two pilots and as many as four astronauts has been redesigned after the Challenger catastrophe to include an ejection seat-type of rescue system.

Since the transport capability of the Ariane 5 rocket is limited, this additional equipment has had the consequence that in the future the transport of useful load must be largely dispensed with and there will be room now for only three or four people in the shuttle. Thus Hermes will no longer be a space transport vehicle but only a vehicle for the transportation of astronauts.

It has not been possible for these studies to be carried out in any further detail because one essential prerequisite for a precise design of the European shuttle has thus far been lacking: namely, an exact plan of the Columbus space station. Only after this later flight destination of the Hermes has been worked out in every detail can the detailed development of the space glider itself be commenced. Columbus in turn has problems to cope with: The Americans, with whose space station the Columbus is to dock eventually, have been for some time thinking aloud about whether or not their space station should also serve military purposes.

But the charter of the European space authority ESA permits international participation in space projects only for peaceful purposes. William Brado in DIE WELT has quoted the "cabinet chief" of the ESA as saying "If the Americans decide in favor of military projects then we shall get out." It is expected that the politicians of the FRG would support him in this position and would not look for arguments in favor of possibly continuing their participation--such arguments as those to the effect that the testing of defensive systems in the space station would not really be objectionable.

And this opposition would also be maintained even if such a position were to have the consequence that Europe would then have to go it alone in establishing a foothold in outer space. But such an undertaking could be expensive. Because the laboratory portion of Columbus, in which some astronauts are to experiment under conditions of weightlessness would by itself be too heavy for the Ariane 5. Hence it would have to be lifted by American transporters or by a still more powerful version of Ariane and the latter would cost a lot of money to develop. Do there exist nonmilitary tasks to be carried out in space which justify such costs (and which cannot be handled in the already available European Spacelab)?

Astronautics Is a Heavy Burden on the Scientific Research Budget

The burden imposed upon the research budget by space technology has already become immense. In the 7.5-billion-mark budget of the German Federal Ministry of Research the domain of space technology accounts for more than 1 billion marks (over half of this sum goes to the ESA). The Max-Planck Society and the German Research Association can only dream of the sort of funding increases which have been granted to astronautic technology--as much as 15.7 percent between 1986 and 1987.

For example, the Max-Planck Society which is primarily active in fundamental research has for the past 15 years been compelled to get along with a stagnating budget. This according to a recent statement by its president Prof Heinz Staab speaking before the science press conference in Bonn. Important institutional innovations--such as facilities for research into the foundations of computer science, for cognitive anthropology, and for terrestrial ecology (particularly the forest ecosystem)--cannot be carried out because the Max-Planck Society must depend entirely upon itself for their capitalization.

Therefore Professor Staab demands that the financing of future space projects should not be the responsibility of the FRG research ministry alone, but that--as already planned for Ariane 5 and Columbus--other entities should share these costs. Activities which do not have purely scientific motivation, according to Staab, require cooperative financing from budgets which do not serve to promote science.

This is all the more true in view of the fact that expenditures for space projects threaten to expand at a rate hitherto encountered only in the case of the fast-breeder reactor. Estimates of the cost of the American space station accelerated within a few years from $8 to $13 billion. The FRG must make sure that it is not pushed into a cost-intensive project (as in the case of the fast-breeder nuclear reactor) in which nonspace industry has no clear interest and participates only because the state is providing massive funds.

Even in space-preoccupied France, the "main engine" of the European thrust into the cosmos, voices are audible expressing skepticism with regard to the logic of some planned projects. When not long ago a colloquium was held in the "Cite des Sciences" in Paris-La Villette on the subject of Europe's future prospects, the president of this international congress, the former French minister of science Pierre Aigrain, defended participation in astronautics programs, declaring that they are necessary if Europe is to be an equal partner of the Americans. But when questioned particularly with regard to the rationality of the space glider Hermes he only shrugged his shoulders and replied significantly: "No comment."

8008
CSO: 3698/482

HERMES INDUSTRIAL STRUCTURE TAKES SHAPE, SAFETY CONSIDERED

Paris AFP SCIENCES in French 5 Feb 87 p 17

[Article: "Hermes: The Structures Are Established"]

[Text] The establishment of the different structures involved in the launching of the Hermes spaceplane program is under way. Within a few days, the ESA [European Space Agency] just announced the granting of the first industrial contracts and the first meeting of the advisory committee on Hermes safety.

Within the framework of the establishment of the Hermes industrial structure, the first contract, which has just been approved by the ESA, concerns the operations of the prime contractor Aerospatiale and the Avions Marcel Dassault company, prime contractor in charge of aeronautics. This contract essentially concerns the study of the configuration of the aircraft by taking into account an in-depth analysis of aspects concerning the safety of launch crews returning to Earth.

Aerodynamic studies required for the design of a spaceplane such as Hermes, which must maneuver in a wide range of flight conditions, from hypersonic during atmospheric reentry, to subsonic at landing, requires in-depth studies and the use of a large number of wind tunnels and other experimental facilities.

A plan aiming to create, improve or put back into service approximately 15 European facilities has just been approved by the ESA. Accordingly, the first contracts approved will be granted to Switzerland (more particularly to the Emmen Federal Aircraft Factory) and the FRG (University of Stuttgart). For the Federal Aircraft Factory this contract, which will allow a wind-tunnel to be reopened, represents 370,000 ECU, and for the West German university, this contract represents 500,000 ECU.

Other contracts, concerning among others the different subsystems for the spaceplane, the ground facilities required for its construction and for its operation, and a large number of related studies are being prepared: more than 250 industrial bids are in the process of being evaluated.

Establishment of an Advisory Committee on Hermes Safety

Presided over by Mr Pierre Govaerts (Belgium) and having Mr Andre Turcat, a former Concorde test pilot, as its vice president, an advisory committee on Hermes spaceplane safety has just been established by the joint initiative of the ESA and CNES [National Space Studies Center]. The first meeting was held 26 January to examine safety problems of future crews.

The role of this independent committee will be to advise the ESA and the CNES on questions of safety concerning Hermes and the Ariane-5, its booster rocket, throughout the construction phase. Composed of 10 members, it brings together experts of ESA member states which have recognized expertise on questions of safety in various high-technology areas, from nuclear engineering, aviation, and space to medicine.

In the current phase of the Ariane-5/Hermes program, CNES is conducting the preparatory programs in progress under the general responsibility of the ESA.

13146
CSO: 3698/307

BELGIUM PREPARING TWO EXPERIMENTS IN MICROGRAVITY

Brussels ATHENA in French Mar 87 pp 43-44

[Text] BioSpace Technology (Footnote)(Avenue Carton de Wiart 148, 1090 Brussels. Phone: 02/426.09.46; Roland Gueubel, president) is a Belgian private company specialized in developing technologies for the study and manufacture of materials under weightless conditions (microgravity). On Wednesday 4 March 1987 it carried out a parabolic flight on board a military twin-seater aircraft, the Fouga Magister, over the Brustem airbase.

Preliminary trials for two microgravity experiments were made during the flight. When an aircraft flies through a parabolic trajectory, the effect of the earth's gravity can be reduced to one percent of its normal value. This parabolic flight was made possible with the assistance of the National Defense Ministry and the Belgian Air Force. Twelve parabolas lasting 25 to 30 seconds each were carried out during this flight. The flight permitted equipment integration and procedures for two experiments to be tested:

- An in vitro fertilization experiment using animal cells. The experimenter is Prof Luc Henriet of the Catholic University of Louvain-la-Neuve, who commissioned BioSpace Technology with the feasibility studies and with the development and integration of the necessary equipment.

An isothermal capsule containing cells to become embryos was carried on the test flight. The parabolic flight made possible the first successful in vitro fertilization of animal cells in microgravity.

- An experiment in fluid mechanics designed by Dr Jean-Claude Legros of the Free University of Brussels, a BioSpace Technology collaborator. This experiment is in preparation for one which will be carried out on board Spacelab D2. Dr Legros was a passenger on the flight and handled preparation of equipment for the in-flight experiments.

According to Roland Gueubel, president of BioSpace Technology, SC, "use of microgravity is a new tool which assists research and industry to acquire new knowledge of processes and to improve them."

The 4 March parabolic testing flight was to be followed by a second flight during which the two experiments based on these first trials would be conducted.

25051
CSO: 3698/A223

FRENCH ULTRAHIGH VACUUM FOR MICROGRAVITY EXPERIMENTS

Paris AFP SCIENCES in French 5 Feb 87 p 26

[Article: "A 45 M Ultrahigh Vacuum Tube for Studying Alloy Solidification Under Microgravity"]

[Text] Grenoble--Starting in mid-1988, French researchers will be able to use a 47-m-high ultrahigh vacuum tube in Grenoble on the campus of the Grenoble Nuclear Studies Research Center (CENG). This will be one of the most powerful devices in the world, over a specific range of parameters, for the study of the solidification of metal alloys under simulated microgravity conditions.

The uniqueness of this vacuum tube is its high vacuum tube (10^8 torr) in addition to the free fall period (3 seconds) exceeded only by the large towers in the United States (100 m and 5 seconds of free fall). The new device will benefit from all the expertise acquired by AEC in the vacuum area with its construction of large accelerators.

Financed jointly by AEC (via the Institute for Fundamental Research and Industrial Development), CNES [National Center for Space Studies] and CNRS [National Center for Scientific Research], this vacuum tower will cost Fr8 million, according to Mr Claude Potard, director of the CENG solidification studies laboratory.

The tower will allow extremely short experiments to be carried out on metal alloys of interest in basic research and possibly the preparation of experiments to actually be carried out in space, according to Mr Jean Hanus, director of the PIRMAT [Interdisciplinary Materials Research Program] of CNRS.

For several years, the AEC has been studying the problem of materials in microgravity and the LES [Laboratory for the Study of Solidification] is one of the most active participants. One of its members, Jean-Jacques Favier, was one of the seven astronauts selected by CNES in September 1985 to fly either on the American Space Shuttle or a Soviet spacecraft.

LES also sent several experiments into space during the first flight of Spacelab at the end of 1983 as well as during flight D-1 of the European space laboratory under the aegis of FRG in October-November 1985.

This Grenoble vacuum tower project was originally an AEC/CNRS matter, since CNRS realized the importance of the microgravity phenomenon in several areas. CNES joined this group by means of its participation in the research group for microgravity applications to materials in space.

According to Mr Hanus, the new device will be open to the entire French scientific community, although it has not yet been determined that it will also be open to manufacturers.

A big effort is underway at both CNES and ESA to promote the use of microgravity for carrying out experiments designed to prepare experimental projects or for the manufacture of industrial products difficult to achieve on Earth due to gravity.

13146
CSO: 3698/307

BRIEFS

FRG-STUTTGART SPACE RESEARCH--In accordance with a decision by the government of the Bundesland Baden-Wuerttemberg, the Aeronautics and Astronautics Department of the University of Stuttgart is to be expanded. Between now and 1989, they will gradually be taking practical needs under closer consideration than before. Among other things, they are planning to establish a new institute for flight mechanics and control. Additional material investments of around DM 4.5 million are also planned. The department is being expanded because they expect that unusually many aviation and space engineers will be needed in the next two decades. In addition, the University of Stuttgart will get a new thin-film laboratory wyich will make it possible to work in extremely dust-free air. [Text] [Frankfurt/Main FRANKFURTER ALLGEMEINE ZEITUNG in German 10 Jun 87 p 31] [Article: "University of Stuttgart Expands Astronautics"] 12507/12851

STUTTGART AEROSPACE FACULTY INCREASED--The Faculty for Aeronautic and Astronautic Technology at the University of Stuttgart is being expanded in response to a resolution of the Baden-Wuertemberg Cabinet. An investment of 4.5 million marks just for physical plant is intended to permit the creation of an institution for flight mechanics and flight control. According to information provided by the university this does not include personnel costs for three new professors or money for better equipment in the other institutes. The technologists of the new institute will among other things create a basis for the development of energy-conserving environmentally desirable power plants. [Text] [Munich SUEDDEUTSCHE ZEITUNG in German 20 May 87 p 6] 8008

DORNIER 328 EXPECTS BONN BACKING--For the development, construction, and sale of the first German short-range transport airplane Dornier 328 which will be capable of transporting 30 passengers even from smaller airports the Munich aeronautic and astronautic firm of Dornier expects financial support from the FRG Government. The design and the technical data for the new Dornier light aircraft were for the first time introduced at a lecture delivered at the Aeronautics Press Club (LPC) under the heading "After the Airbus, What Next?" in Bonn. This successor of the 19-place Dornier 228, 100 of which are flying in all parts of the world, will have a pressurized cabin so that passengers can be transported above the weather and hence more comfortably. The cruising speed of the turboprop aircraft will be 575 km/hr and its range will be 1,300 km. The 11-ton aircraft will have a useful load of 3.4 tons. In addition to greater economy, the aim will also be particularly to achieve greater attractiveness. The fuselage will have an optimal configuration consistent with the results of a technological program sponsored by the German Federal Ministry of Research. [Text] [Munich SUEDDEUTSCHE ZEITUNG in German 20 May 87 p 7] 8008

AERITALIA TO SUPPLY AVIONICS FOR AMX--Milan, 30 April 1987--Aeritalia's Avionic Systems and Equipment Group has designed, developed and implemented the avionic system for the AMX tactical fighter, which consists of all the equipment on board which performs the aircraft's navigation and attack functions. A central calculator on board, duplicated in order to ensure the necessary redundancy in the system, controls the exchange of information among the component units and executes the necessary calculations for carrying out the requested functions. The system used for the exchange of information is of the digital multiplexer type and among the more advanced used by the Western world. [Text] [Rome TELEINFORMATICA 2000 in Italian 27 Apr 87 p 2] 13209/12859

CSO 3698/534

EC ENVIRONMENTAL DOCUMENT OUTLINES CONTROL MEASURES

Bonn TECHNOLOGIE NACHRICHTEN-PROGRAMM INFORMATIONEN in German No 396, 20 Mar 87 pp 7-8

[Excerpt of the "Draft of the EC Commission based on the decision of the EC Council to assess and develop an environmental policy and to carry out an action program for environmental protection (1987-1992);" date of issue not given]

[Excerpt] Biotechnology

In the past few years there have been dramatic developments in biotechnology which have had considerable political effects on the Community. The [EC] Commission has played a leading role in the development of a community strategy for European biotechnology, especially in the development of a rational procedure for recombinant DNA research. For some time, the Community has issued regulations in certain fields of biotechnology application, including foodstuffs, pharmaceuticals and agriculture, which are revised, as necessary, to correspond to the state of the art.

Part of the current 1985-89 biotechnology research program concerns the investigation of risk evaluation techniques; through the revision of the program, this will be continued and extended.

With regard to environmental protection there are two important aspects. On the one hand, biotechnology is potentially useful in environmental protection, for example in water purification or in the reduction of the oxygen consumption of organic waste produced by industries which process biological material and in waste detoxification. On the other hand, there is no doubt about the government's concern over the new advances and the risks involved in genetic engineering, especially the anticipated increased use of new organisms in agriculture and in the environment.

The European Community obviously is interested in the control of possible dangers involved in the use of biotechnology because new or novel organisms can reproduce and cause problems, as has happened in the past due to the infiltration of natural, pathogenic germs into a new environment. The rapid development of the branches of industry which use modern genetic engineering

techniques means that the potential environmental consequences of biotechnological processes and products will multiply rapidly if appropriate precautionary measures are not taken.

Years of experience in fields such as health care and environmental protection show that it is better to evaluate the potential dangers as early as possible before large-scale technical production so that, in an emergency, preventive measures can be taken. The innovator must clearly accept responsibility for the provision of sufficient information for examination by legislatures. This examination can be supplemented by an additional control depending on the outcome of those carried out previously.

There is much to be said in favor of the application of these measures throughout the Community, both for the protection of the health and environment of EC citizens and for the protection of the common market against individual government rules. As has been learned from debates with senior officials from member states, the Community must act more quickly and decisively to create comprehensive guidelines for the development of processes and products using genetically engineered organisms. Consequently, the Commission has already begun work on the development of such measures for the protection of health and the environment with the assistance of a competent committee for biotechnology research guidelines (BRIC) set up by the Commission itself.

Hence, a comprehensive plan for the protection of the environment against possible dangers caused by genetically altered or exotic organisms is necessary in the following fields:

--Type (and likely viability in the environment) of organisms produced;
--Method of production used;
--Release into the environment during production;
--Waste disposal and cultivation practices;
--Accident prevention and type of danger in case of accidental release;
--Understanding, supervision and control of survival, propagation and diffusion;
--Population groups and propagation areas at risk;
--Effect of organisms on people, other species and ecosystems.

Strictly speaking, it is not possible to distinguish between the risks caused by organisms which already exist, those caused by organisms developed through traditional methods of genetic engineering and those caused by organisms produced by the more advanced methods of modern biotechnology. The variety of possibilities for new applications of genetically modified organisms could increase the risks in application if their development does not take place according to clearly defined legal terms.

Measures concerning new organisms must distinguish between dangers in two different application fields. On the one hand, dangers of application in industry of genetically engineered organisms, which basically do not require any additional measures beyond those taken in the past; on the other hand, in the case of the intentional release of new organisms into the environment (live vaccines, micro-organisms for detoxification of wastes or for biological

pest control or new plant and animal species), experience has shown--through the ecological effects of exotic species on the existing population--that special measures are necessary.

The Commission intends to explore the requirements and to present proposals to the Council in two main fields:
1) Classification, limitation and control of dangers for people and for the environment caused by the production, application and disposal of new organisms.
2) Notification and consultation concerning intentional application of new organisms in the environment.

In the first field it is necessary to harmonize standards and procedures for classification, packaging, accident control, emergency planning and reaction, and elimination of potentially dangerous organisms used in industrial production processes through waste disposal. In the field of intentional releases, the introduction of a Community-wide notification and approval system is necessary.

Since no member state (or any other country) has yet issued comprehensive guidelines in this field, this is an ideal opportunity for the Community to develop appropriate rules both for itself and as an example to other countries. Therefore, the Commission, in addition to dealing with the internal measures described, will also work to expand and strengthen the effects of these measures by means of negotiations within the OECD and other international organizations.

At the same time, the Commission will continue and expand scientific research in the evaluation of dangers caused by the development and application of biotechnology.

8701
CSO: 3698/M284

GENETIC ENGINEERING PROJECTS IN UK, FRANCE COMPARED

Paris BIOFUTUR in French Apr 87 pp 61-62

[Article by Julian E. Davies, head of Microbiological Engineering Unit, Pasteur Institute, Biotechnology Departement, 25 rue du Dr Roux, 75724 Paris Cedex 15: "Great Britain: A New Program in Antibiotics and Genetic Engineering"; first paragraph is BIOFUTUR introduction]

[Text] The Biotechnology Directorate of Britain's Science and Engineering Research Council (SERC) has announced a new program for joint research by universities and industry: "Antibiotics and Recombinant DNA." In 1980, the SERC conducted a similar program in protein engineering. Funding for the first 3 years of the Antibiotics and Recombinant DNA program will be 1.4 million pounds (approximately Fr 13 million). The Biotechnology Directorate will provide the first half of the funding, the remainder will come from four British companies (Apcel, Beecham, Glaxo, and Imperial Chemical Industries), the Department of Trade and Industry, and the Committee for Biological Sciences. The program will support 12 research projects in 11 universities. Research topics will also involve both Streptomyces and Aspergillus nidulans. They will involve fundamental study on the physiology of these microorganisms and on controlling the biosynthesis of primary metabolites. The goal of the research is to produce secondary metabolites of industrial interest--antibiotics--more efficiently.

Each project will receive 50,000 to 250,000 pounds (about Fr 500,000 to Fr 2.5 million) in funding for 3 years. Projects include, first, a study of the transport and biosynthesis of histidine and proline in Streptomyces coelicolor; and second, as regards Streptomyces in general, an analysis of the replication, transfer, and stability of plasmids as well as development of a transposition system. The fungus project centers on beta-lactamine-type antibiotics; the Aspergillus nidulans strain has been selected as the reference organism. Although it is not an industrial strain, this fungus is an excellent model due to its genetic and biochemical properties. The research program on Aspergillus nidulans focuses on analyzing the regulation of gene expression, particularly of those genes which produce the intermediaries involved in beta-lactamine synthesis. At present, the genetic manipulation of fungi is not very much developed due primarily to the lack of an effective transformation system. Therefore, the purpose of certain genetic

and molecular research projects will be to develop an effecient transformation system.

These ambitious research projects involve common themes designed to maintain a coordinated research program and close cooperation between Britain's academic laboratories and those of industry. Historically, the UK has always maintained a key position in antibiotics research.

Work by university laboratories will be coordinated by a program director from the university, who will ensure interaction and collaboration between the universities and their industrial sponsors. This collaboration should lead to the creation of new jobs for British researchers. About 27 posts will be created and, at the end of the program, some of them could be converted into positions in industry. Thus, a limited investment could provide both research funding and advanced training. It is hoped that this program will result in real collaboration and that all the resources of industry (equipment, etc.) will be made available for this program's work. It certainly is a good deal for the industrial participants who are providing only 20 percent of the financing!

Do similar initiatives exist in other countries? France and the FRG have established a bilateral program split 50-50 between industry and the government. France is investing about Fr 5 million in the "Performing Host-Vector Couples" program. (We should note that one of the British research projects alone will cost Fr 2.5 million!) In the United States, the National Science Foundation is financing a program for collaboration between industry and university laboratories. However, it appears that only the UK is developing such an ambitious research program which applies basic research so extensively to industrial objectives. What will happen to the rights of the inventor in such a program? The presence of a British expert at the first program conference, scheduled for March, is indeed significant! At the conference he will discuss problems relating to patents and intellectual property.

The SERC is considering other activities for the future and has announced the establishment of a research program for animal cells system development with a view to protein production.

25041
CSO: 3698/A222

BUNDESTAG CONSIDERING MORATORIUM ON GENETIC ENGINEERING

Paris BIOFUTUR in French Apr 87 p 12

[Article: "Will the Proposals Made at the Bundestag Help Prepare Legislation on Genetic Engineering?"]

[Text] The Bundestag Commission (FRG) has presented a report on the "promise and risk of genetic technology." Representatives from every group in the Bundestag together with research and industrial scientists--a total of 17 people--participated in the preparation of this report. The goal is to aid the Bundestag in developing new legislation as well as to serve as a starting point for informing the general public: one of the concerns of the EC Commission's CUBE [Concertation Unit for Biotechnology in Europe]. Although generally supportive of genetic engineering, the report proposes a 5-year moratorium on the release of genetically modified microorganisms into the environment. In the meantime, risk evaluation methods would be improved and systems would be developed to monitor the development of these microorganisms in nature. After these 5 years, requests would be reexamined on a case by case basis.

Genetically modified plants and animals could only be used in accordance with safety regulations yet to be defined and to be included in legislation on epidemic control.

The genetic transformation of a plant to increase its resistance to a specific pesticide would be authorized only to the extent that this modification would allow the substitution of one toxic pesticide by a less dangerous one.

Genetic engineering is a welcome means of making improvements, as is the use of transgenic animals in basic biomedical research.

All laboratories working on gene modification or production would have to register with a central institution, and some genetic manipulations could be completely prohibited. The viewpoints expressed in this report are already familiar. Are not Denmark, the Netherlands, and the FRG running the risk that promising firms might change course or leave the country altogether?

Mr Mark Cantley of CUBE points out the quality of the report, but fears that a 5-year moratorium could stop the very research aimed at improving our evaluation of the risks.

25041
CSO: 3698/A222

'DESY' SYNCHROTRON USED FOR PROTEIN STUDY IN FRG

Braunschweig BIOTECHNOLOGIE in German May 87 pp 21-23

[Article by Walter Frese of the Max-Planck-Gesellschaft: "Electrons at the Speed of Light Illuminate Molecules: Synchrotron Radiation--Resource in Biological Structural Research: Diffraction X-Rays Take Their First Step"]

[Excerpts] Synchrotron radiation, once only energy-dragging waste in high-energy physics, has recently proven to be a valuable resource in biological structure research. The high intensity and special quality of the X-ray light provided by the synchrotron makes it possible to rapidly and at the same time safely resolve the refined structure of complex biomolecules, even down to the atomic level. In addition, it can be used to record dynamic processes, such as "contact" and reaction between an enzyme molecule and its substrate molecule, in individual photographs. In order to use and extend these potential applications, the Max-Planck-Gesellschaft in Hamburg has recently set up three study groups for structural molecular biology. The "source of light" for these groups, which are working closely with the University of Hamburg, the Hamburg Synchrotron Radiation Lab (HASYLAB) and the European Laboratory for Molecular Biology (EMBL) is the DORIS storage ring at the German Electron Synchrotron--DESY for short.

In DESY, electrons are accelerated to close to the speed of light on a ring-shaped track measuring around 100 meters in diameter. The physicists use these high-energy electrons as "bullets" for impact experiments, in which they can generate and study various types of short-lived elementary particles.

The DORIS storage ring, into which the electrons from the DESY are fed, also serves these purposes. In it, the electrons circulate in the form of separate groups, as clouds so to speak, on an oval track.

In the curves of this oval, the electrons are deflected by curved magnets, and in this way they emit so-called synchrotron radiation. This radiation is emitted by the electrons in the direction of movement and is tightly packed into a small dihedral angle, similar to the light from a car's headlights as it goes around a curve.

Vacuum tubes that branch off tangentially from the guide channel of DORIS conduct the synchrotron radiation to the numerous experimental work stations in the great hall of HASYLAB, the Hamburg Synchrotron Radiation Lab. In a room measuring 1,200 square meters, 26 "radiation units" are set up at which physicists, chemists, biologists and technicians are able to use this waste product from the accelerator for a multitude of problems.

Choice of Wavelength

This multitude of applications comes from the special properties of synchrotron radiation. This includes first of all a broad spectrum of wavelengths, from infrared to visible and ultraviolet light, to very harsh, short-length X-radiation. The wavelengths suitable for each experiment can be filtered out from this.

At the same time, this radiation is very intensive. In the X-ray range--and thus in the area of the spectrum that is important for analyzing biomolecules, it exceeds the intensity of radiation from a standard X-ray tube by a factor of 100 to 1000. In addition, the synchrotron radiation is packed about as tightly as the light from a laser and is emitted in the form of ultra-short light flashes because the electrons circulate in the storage ring in individual "clouds." And finally, synchrotron radiation is polarized, meaning that its waves oscillate in a plane, so that it is possible to make visible specific privileged directions within the molecule structures under study.

For the scientists in the three study groups for structural molecular biology, the high intensity of synchrotron radiation is of primary importance, because they are interested in the structural analysis of protein molecules. To this end, the molecules, which are either ordered crystals or in solution, are "illuminated" with X-rays of the appropriate wavelength; these rays are then diffracted in the molecules, depending on their structure, and fanned out into numerous single rays. From the intensity and direction of the individual partial rays, which are measurable using appropriate detectors, conclusions can be drawn about the structure of the proteins.

Because proteins yield only weak X-ray contrasts, analyses such as these using traditional X-ray tubes require very length measurement times, of several hours up to several days. This is because in order to get the complete space structure of a molecule, diffraction patterns of it must be taken from many different directions. However, many proteins are too unstable and sensitive to stand up to such a tedious process; they change or decompose under the continual effect of high-energy X-rays.

Fast and Safe

This is the decisive advantage of the synchrotron: Its radiation, one hundred to one thousand times more intensive than that of an X-ray tube, reduces the measurement time to several minutes. Structural analyses can in this way be made of especially "sensitive" proteins rapidly, and thus at the same time safely. In addition, special experimental tricks can be used to record rapid reactions by a protein.

The three Hamburg study groups are working closely with various Max Planck institutes where the relationship between the structure and the function of biomolecules is being studied. The group led by Prof Ada Yonath is working with the Max Planck Institute for Molecular Genetics on elucidating the structure of ribosomes--the "protein factories" of cells in which all cell-specific proteins are produced, according to genetic information.

Protein According to Plan

In the past, the department of the Max Planck Institute for Molecular Genetics in Berlin headed by Prof Heinz-Guenter Wittmann has been able to shed light on a total of 53 proteins of a ribosome in their primary structure, meaning in the sequence of their individual amino acid components. The fundamental arrangement into two sub-units and the external shape of the total molecule have also been verified by electron microscope.

However, the space structure of the individual proteins, as well as their interactive linkage and arrangement within the ribosome, have remained a mystery. The synchrotron is now intended to bring light to this "black box," allowing insight into the internal constitution, and thus also into its exact function.

Dr Yonath succeeded a little while ago in crystallizing ribosomes as whole units as well as their sub-units, thus creating the precondition for structural analysis using X-radiation. The synchrotron represents the ideal source of radiation for this analysis, since the ribosome crystals are on the one hand very large and on the other hand very sensitive.

Recently, Dr Yonath and her staff also developed a new method for cooling the ribosome crystals very rapidly to -180 degrees Celsius, thus to a certain extent freezing them and in this way increasing their stability. This process signifies an additional gain in measuring time and an important step towards the goal of "transilluminating" and uncovering the internal workings of the molecular protein factories of cells.

"Working" Molecules

The group led by Dr Hans Bartunik, which is cooperating with the department headed by Prof Robert Huber and Prof Dieter Oesterhelt at the Max Planck Institute for Biochemistry in Martinsried, near Munich, is also working on problems of time, albeit of a different type.

This group is concerned with dynamic aspects of protein structures, i.e., structural changes that turn up in certain proteins in the course of biological reactions. This includes proteinase, which reacts with other proteins--their respective "substrates"--something like a digestive enzyme, splitting and decomposing them.

Enzymes in Hibernation

Intensive synchrotron radiation, combined with rapid X-ray detectors, for the first time creates the possibility of recording such reactions in individual interstages. Cryogenic and refrigeration technology offer one way to achieve this: The enzyme crystals are cooled to between -5 and -50 degrees Celsius and in this way allowed to enter a sort of state of "hibernation." The substrate molecules are then fed in and the temperature is raised far enough that the enzyme "thaws out." It then begins to work, albeit much more slowly than at normal temperatures--and thus slowly enough for corresponding diffraction patterns at certain states to be registered by way of synchrotron radiation. In addition, there are also molecule reactions that can be triggered by an external signal--such as a laser pulse--and repeated cyclically during the experiment.

In order to resolve such processes in time and to record them step-by-step, use is made of the fact that synchrotron radiation is emitted in individual pulses. With DORIS, these flashes, corresponding to the interval of the electron clouds circulating in it, take place at intervals of approximately one microsecond. This makes possible a sort of "stroboscope technique": The reaction of the protein is triggered by the laser pulse, and a structural measurement is then taken at a certain time interval. By continually repeating this process and appropriately selecting the time range between excitation and measurement, the protein image can be preserved at separate interstages. Bartunik and his colleagues have already used this process to successfully record structural changes in the range of milliseconds.

In this way, using the synchrotron to produce X-ray structure images has to a certain extent taken its first step, and could in the future move even faster, provided that appropriate detectors and higher-energy synchrotrons are available. The Hamburg scientists consider a distant goal--and one that can in principle be achieved--to be structural measurements in the range of micro- and nanoseconds.

The third study group, led by Dr Eckhard Mandelkow and Dr Eva-Maria Mandelkow, comes from the Max Planck Institute for Medical Research in Heidelberg. The Department for Biophysics there, led by Prof Kenneth C. Holmes, first conducted structural analyses using synchrotron radiation more than 10 years ago. At that time, it was a pioneering project that showed the value of the synchrotron as a resource in molecular biology through work on muscle fibers.

Mandelkow and his colleagues are also working on a special type of fibrous proteins, the microtubules. Components of the so-called cell skeleton, these are hollow, cylindrical strings whose walls consist of single, parallel-positioned and spirally wound tubuline molecules.

The microtubules are capable of organizing themselves and of gathering into hollow bundles. Mandelkow and his colleagues want to use synchrotron radiation to investigate how and according to what principles this self-assembly takes place. To this end, isolated tubuline molecules in solution together with associated proteins are introduced, initially "supercooled," to the radiation path of the X-ray light from the synchrotron. The temperature is then raised in surges, thus triggering the orientation and self-organization of these molecules into microtubules. By adding certain control substances that are always present inside cells, the question of how and what chemical factors influence this process and change the structure of the microtubules can also be studied.

PHOTO CAPTIONS

1. p. 21 The X-ray diffraction instrument built by the European Laboratory for Molecular Biology (EMBL) in the experimental hall of the Hamburg Synchrotron Radiation Lab (HASYLAB) at DESY: The X-ray is fed from the DORIS storage ring through the protecting wall in the rear, where it encounters a test chamber filled with protein solution. The diffracted rays pass through an evacuated tube and are then registered by detectors. Using this instrument, the self-organization of biopolymers can be studied--such as the self-assembly of microtubules being studied by Dr Eckhard Mandelkow (shown above) and his colleagues in one of the three study groups for structural molecular biology set up by the Max-Planck-Gesellschaft in Hamburg. Photo: MPG-PRESSEBILD/Filser.

2. p. 23 In this freezing unit used in cryogenic electron microscopy, a ball-shaped specimen carrier (center) is injected into a deep-cooled liquid. The specimen solution freezes so quickly that no ice crystals form that can destroy the structure of the proteins. Cryogenic electron microscopy is one of the additional and complementary methods of X-ray diffraction analysis enlisted by the study groups for structural molecular biology of the Max-Planck-Gesellschaft for their experiments. Photo: MPG-PRESSEBILD/Filser.

12271
CSO: 3698/560

BRIEFS

NETHERLANDS PROTEIN ENGINEERING--An extensive protein engineering program has begun at the Groningen Biotechnology Center (Netherlands). Work will focus exclusively on the study of transporters in membranes, their sequencing, characterization, and finally their mass production in some receptive host. Then, to obtain a high performance filter capable, for example, of separating amino acid stereoisomers, one would only need to readjust these transporters for use with artificial membranes. This program is to receive 20 million guilders in funding from the University of Groningen, government, and private companies, including Gist Brocades, Unilever, and some American companies. Professor Konings, Groningen Biotechnology Center, Rijksuniversiteit, Groningen, Nyanborg, 9747 NL, The Netherlands. Phone: 31-50-632152. [Text] [Paris BIOFUTUR in French Apr 87 p 12] 25041

CSO: 3698/A222

BMFT ANNOUNCES SUBSIDY PROGRAM FOR NEURAL COMPUTING

Bonn TECHNOLOGIE NACHRICHTEN--MANAGEMENT INFORMATIONEN in German No 454, 24 Apr 87 pp 5-6

[Text of "Public Announcement of the Federal Ministry for Research and Technology [BMFT] Regarding Subsidies for R&D Projects in the Area of Data Processing;" issued on 25 March 1987]

[Text] I. The BMFT intends to grant subsidies for R&D projects in the area of data processing under the theme of "Data Processing with Neural Architectures."

Based on the latest findings of theoretical neurobiology, the models regarding the functions of the brain developed up to now will be translated into new methods of data processing. A longer term goal is the development of a massive parallel computer architecture whose network is based on the brain's neural structure. For this purpose, first of all, neural processing and memory strategies are to be formulated in algorithms, and the feasibility of the resultant technical systems is to be demonstrated by computer simulation. Although the development of methods and theories is a priority task for the time being, this does not exclude the technical developments for comprehensive applications as demonstration models.

The following aspects should be emphasized:

1. Development of a general data format for massive parallel systems.

An essential prerequisite for the solution of numerous technical problems is a data format that can be used as a basis for the representation of sensory and motor applications and strategies. This data format can, in turn, be used in flexible ways for a multitude of tasks in various subsystems and will finally allow the integration of subsystems into a functional overall system. Special attention must be paid to the implementation of already available knowledge on important neural structures such as specific topological arrangements, subdivision in hierarchies and easy combination of structures for a variety of tasks.

Subsidies are to be granted for projects which develop such a data format based on existing initial research in neural architecture and which prove to

be on task with respect to performance and the cost of development.

2. Development of mechanisms for self-organization

In order to coordinate various programming efforts, the systems to be created must be inherently flexible with regard to changes in tasks and compatibility. This assumes efficient methods of self-organization, on the one hand, for the generation of functional conditions and, on the other, for the autonomous assimilation, evaluation and generalization of knowledge. These methods must be capable of working in parallel and must be based on the data format mentioned above.

Projects that further develop existing self-organization designs and investigate their structure, efficiency and stability as well as the computer requirements for specific applications are to be subsidized within the framework of the project.

3. Development of specific applications

The principles mentioned in paragraphs 1 and 2 are to be applied, for example, to problems of the following kind:

a) Integration of associative memories into processing systems,
b) Model-supported image interpretation, analysis of variable scenes, possibly with the observer in motion,
c) Comprehension of language,
d) Motion guidance, sensory motor coordination, support of dynamic perception.

In the pursuit of these goals the main emphasis should be placed on basic solutions. However, as a matter of principle, it has to be possible to scale model structures to the processing of realistic problems without divergence of iteration times, learning times and hardware requirements. This does not exclude directly applicable technical solutions. Implementation problems, however, will play a greater role in the second phase of the project.

II. A prerequisite for receipt of a subsidy is common planning and sharing of R&D tasks by various partners within the framework of a 5-year joint project scheduled to start in January 1988. Thus a concentration on research priorities is to be achieved through the necessary combining of limited resources which requires that proposals from interested partners be coordinated in advance. A group of specialized scientists has agreed to coordinate the presentation of joint projects. Applications falling into the framework described above may be sent through 28 May 1987 to the representative of the aforementioned group of scientists, Prof Dr Werner von Seelen, Johannes Gutenberg University, P.O. Box 3980, 6500 Mainz 1, in the form of short project outlines with descriptions of the research objective, work schedule and financial needs.

The BMFT management principles in effect at the time of presentation apply to subsidies. A right to receive a subsidy does not exist. Subsidies will be distributed according to budget availability.

Applications by industrial companies generally require company participation at a rate of 50 percent of the cost.
Bonn, 25 March 1987
413--5801--5--5/87
On behalf of the federal minister of research and technology by Thomas

8617
CSO: 3698/M267

NATURAL LANGUAGE PROCESSING R&D AT CNET, CNRS OF FRANCE

Paris INDUSTRIES ET TECHNIQUES in French 20 May 87 p93

[Article by E.S. under section "Dialogue with the Computer: Phonetics, Syntax, Orthography"]

[Text] The French are actively involved in research on man-machine communication, mainly in the areas of speech and natural language processing. They have undertaken several projects along these lines.

The National Scientific Research Center (CNRS) has one Coordinated Research Program (PRC) on man-machine communication, another PRC on computer linguistics, and a Concerted Studies Group (GRECO) on spoken communication. The GRECO research project on spoken communication is rather well structured because the teams have been collaborating in this field for nearly 20 years. Of its 5 studies, the first, piloted by the ICP [Institute of Spoken Communication] of Grenoble, deals with building a data base of French sounds. The objective is to learn more about the acoustic structures of the language and have available common corpora for conducting comparative tests on different systems of voice recognition. A second project, conducted by CERFIA [Cybernetics of Businesses, Recognition of Forms, Artificial Intelligence] of Toulouse, is focused on creating a lexical data base of French. There are also three more specialized research projects: acoustic-phonetic decoding, piloted by the LIMSI [Computer Science Laboratory for Mechanics and Engineering] of Orsay; an in-depth study of prosody, headed by the Phonetics Institute of Aix-en-Provence; and the study of the properties and architectures of man-machine communication systems under the aegis of the Computer Science Research Center of Nancy (CRIN). Other agencies have taken an active interest in speech: the Telecommunications Studies Center is pursuing a whole series of rather involved projects; IBM's research center is working particularly on speech-operated typewriters; the laboratories of the French General Electric Company (CGE) at Marcoussis are studying continuous speech recognition and the distribution of Thomson underwater equipment for acoustic-phonetic decoding.

Efforts have been less organized in dealing with natural language. One study in the PRC on man-machine communication centers on natural language. Headed by the LIMSI people, it deals particularly with the correction of spelling and typographical errors and the development of syntactic and semantic analyzers

that are error-proof. The recently created PRC on computer linguistics will become the responsibility of the CERIL [Center for Study and Research of Computer Linguistics] of Evry, which will open in September and include two laboratories formerly part of [University of] Paris 7: the LADL [Laboratory of Documentation and Linguistics Automation], and the LITP [Laboratory of Theoretical Computer Science and Programming]. The CERIL will work on the creation of a complete syntax dictionary of the French language, on the study of phrase-generating algorithms necessary for natural language communication, and on semantic representations and their implementation. Other public laboratories interested in natural language comprehension include the GIA [Artificial Intelligence Group] of Marseille and the University of Villetaneuse. In the business sector, technically specialized companies, such as Erli or Intellexis, are certainly involved in research and development activities. IBM and Bull are developing data base interfaces using natural language, and Cap Sogeti is working on text generation and spelling correction. Also, the UAP insurance group has set up a research division to develop the use of automation for purchasing insurance policies.

PHOTO CAPTION [Photo not reproduced]

With the help of vocal system models and sonograms, the Lannion National Telecommunications Studies Center (CNET) is conducting research on the digitalization of the human voice (Photo by P. Plailly).

13393
CSO: 3698/510

NEW FRENCH REAL TIME COMPUTER FOR INDUSTRIAL USE

Paris ELECTRONIQUE ACTUALITES in French 15 May 87 pp 1,4

[Article by H. Pradenc: "Amaia Introduces a LISP-PROLOG Symbolic Computer Designed by the CNET and the CGE"; first paragraph is introduction in ELECTRONIQUE ACTUALITES.]

[Text] Amaia, the French company interested in artificial intelligence and man-machine interfaces, is announcing the release of a Lisp and Prolog symbolic computer intended especially for real-time industrial processing. In addition, the firm is marketing a family of Lisp processors for PC's and compatibles.

Maia, introduced as the first symbolic computer in Europe, was developed by the National Telecommunications Studies Center (CNET) and the Marcoussis Laboratories of the French General Electric Company (CGE) with the help of the Amaia company. This firm along with the company Copernique, will handle manufacture and sales under CNET-CGE license.

The machine is designed for use in industry. Communication is executed through a VME bus. The coupling between Lisp tasks and the nucleus of the system makes it possible to manage interruptions on the bus. According to Amaia, a Lisp task allocated to the monitoring of a procedure can be activated less than 50 microseconds after the occurrence of the event that triggered the task.

Maia uses an interface linked to an Ethernet network (TCP IP, Telnet, FTP), and though allowing only a single user, it can be implemented as a symbolic server with several work stations. Designed for real-time processing, Maia can simultaneously support 31 tasks. Switching between two Lisp tasks is executed in 5 microseconds. Emile, Maia's editor originally designed by the CGE, is combined with the window manager to make up the machine's user interface.

Three Specialized Processors

Three specialized and independent processors handle symbolic calculation. One manages the virtual memory and guarantees the exchanges between the main memory and the disk drive.

The second is dedicated to graphics, with a screen display of 1,024 x 1,024. Finally, the symbolic calculation executes Lisp and Prolog programs.

The main memory can contain up to 80 million 8-bit bytes (Mo) (16 million words of 40 bits). The virtual memory is physically embedded on a 470 Mo disk. The manufacturer has announced that Maia will be available for beta test next summer, with a model of average configuration costing from Fr800,000 to Fr1 million, depending mainly on the memory size.

With a staff of 28, Amaia has realized a turnover of Fr10 million for 1986, 60 percent generated by research programs. This year's target is Fr20 million. Since its formation in 1984, Amaia has played an important role in the transfer of technology from research to industry. The firm wants to reflect a more industrial image in the future, which, in terms of turnover, should show a relative drop in profits from research contracts.

13393
CSO: 3698/510

BULL JOINT VENTURE FOR EUREKA MULTIMEDIA PROJECT

Amsterdam COMPUTABLE in Dutch 10 Apr 87 p 11

[Text] Bull has set up a joint venture with the French software company Copernique to develop a multifunctional workstation within the framework of a EUREKA project. The company called Archimede is already collaborating with ICL [International Computers Limited], while associate partners are also being sought.

The Multimedia Open Standards European System (MOSES) is one of nearly 100 projects that received the EUREKA label at the European ministers conference in late June 1986. A budget of 170 million guilders has been allocated to this project. Bull expects the first prototype of a workstation suitable for processing and managing text, data, graphic images, and voice (Bull speaks of a multimedia information system) to be ready by the second half of 1988.

Associate Partner

One of the major characteristics of this system is its support of a great number of international standards. The development of the system architecture will be based on international standards such as ISO and CCITT, as they were selected and adopted by the European Standards Promotion and Application Group (SPAG).

Electronic mail will be based on the X.400 standards, whereas the Office Document Architecture (ODA) developed within the context of ESPRIT will also be followed. ODA provides for an unambiguous definition of documents in which text, data, images, as well as speech notations can be included.

The information system to be developed will use Unix System V as operating system and will comply with the recommendations of the X/Open Group. Communication with other equipment will be established through an IEEE 802.3 network (Ethernet). The final standard to be adopted will be the ANSI standard to retrieve data from databases. Database users will thus be able to use a Structured Query Language (SQL) implementation.

In a statement Bull explains that Archimede is seeking associate partners. This status will be granted to small- and medium-sized firms not as yet involved in a EUREKA project and wishing to benefit from the possibilities of a wide market through a contract with Archimede. A first partner has been found: the Belgian company Microelectronique SA.

25059
CSO: 3698/A211

BRIEFS

GERMAN AI CENTER--Heinz Riesenhuber, West German minister of research and technology, has announced that in 1988 a center for data processing research, specializing in working out artificial intelligence programs, will be established. It will be located in Kaiserslautern, in the western center of the FRG, and 60 researchers will be employed. The research minister will provide funds during the first 5 years on the order of DM5 to 10 million per year. The German data processing industry agreed to take over afterwards. [Text] [Paris ZERO UN INFORMATIQUE in French 6 Apr 87 p 11] 25062

FRG:HESSEN TECHNOLOGY DATABASE--The Kassel Chamber of Industry and Trade has set up a specialized information communications center which will give access at the present time to up to 150 domestic and foreign data banks. This includes especially information in the areas of economics, technology, patents, and research. For the technological data bank of North Hessen which has been created by the trade chamber as many as 400 North Hessen enterprises in the areas of industry, trade, and especially technological services are offering about 3,000 items of data concerning their products and their needs in the domain of manufacturing knowledge and process knowledge. The chamber wishes to seek out possible partners for inquiring firms. Use of the data bank is at first to be free of charge. It is also said that additional domains in the area of trade and services will be taken into the system. [Text] [Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 6 May 87 p 8] 8008

CSO: 3698/481

ESPRIT II FOCUSING ON MOBILE ROBOTS

Zellik TECHNIVISIE in Dutch 1 Apr 87 pp 6-7

[Article by H. Van Brussel: "Autonomous Mobile Robots Are Being Developed in the MKP Department at the Catholic University of Louvain"]

[Text] The industrial robots craze is subsiding. Market growth is not in line with the expectations. Industrialists are hesitant to invest. Attendance figures at symposiums, conferences, and seminars are stagnating or dropping. After the disillusionment we are in the midst of a period of reflection. However, developments are continuing steadily especially in university laboratories. ESPRIT II considers robotics to be of paramount importance. The MKP [Mechanical Construction and Production] department led by Prof H. Van Brussel at the Catholic University of Louvain is one of the major partners in a recently launched ESPRIT project, named SACODY, which aims at developing a new generation of rapid, light, and flexible assembly robots. Details will be published later in an official statement.

Mobile robots is an area of robotics in which feverish activities are being carried out, among others within EUREKA. The MKP Department, led by Prof H. Van Brussel at the Catholic University of Louvain, has been active in this field for quite some time. The aim is to escape the restrictions that limit the autonomy of the traditional AGV's (automatic guided vehicles). These transport vehicles are guided along a track or an inductive system with conductors installed on the floor. These systems are, thus, tied to a fixed path.

Two ongoing projects at the MKP Department aim at breaking out from this fixed trajectory. The first and more fundamental project involves the use of ultrasonic sensors to obtain information about the unfamiliar environment. A rotary sensor scans the surroundings and charts them. Given a specific starting and end position, an optimum obstacle-free route is planned using this information. The development of this planner is continuing in close collaboration with the Computer Sciences Department of Prof Y. Willems at the Catholic University of Louvain. This planner uses heuristic techniques from the field of artificial intelligence and has been programmed in Prolog. The robot is a tricycle with two independently driven front wheels and a swivel wheel at the rear. Control at the lowest level consists of a condition regulator with a condition evaluating device using position information

obtained by odometry on the drive wheels. Work is now focused on expanding the hierarchical control system in which the real-time use of the on-board planner is a major task.

The second project was commissioned by the Dutch company ICH (Industrial Contractors Holland) and was given the code nam FROG (Free Ranging On Grid). The name reflects the method adopted to increase the autonomy of the vehicle. The FROG concept is mainly based on odometry. The accumulation of position errors, which are inevitably linked to this type of method, is compensated by a grid. Two alternatives have been developed for this grid: a line grid and a dot grid.

The line grid consists of a field of perpendicular lines positioned on or in the floor surface.

When Stelcon plates are used, the grid is already available in the steel edges of the plates. In Louvain a dot grid solution is being researched. The dot grid is a matrix obtained by setting passive elements at the vertices of an imaginary line grid. These pointed elements may be either steel nails, magnetic cores, or electronic responders. A frame antenna installed under the vehicle transmits a magnetic field. The responder draws sufficient energy from this field to send its own code. This absolute code makes it possible to determine the vehicle's position at regular distance intervals and consequently compensate for accumulated odometry errors.

The grid, the location of buildings, machines, and other obstacles are stored in the FROG memory. They can also be obtained by scanning the surroundings with a distance sensor. Once the final destination has been given, the optimum route is calculated using the current starting position and the stored environment map. As grid elements are crossed the odometric data is corrected so that the planned route is maintained.

The application field of autonomous mobile robots is tremendous, e.g., distribution, assembly, production. The function might be a combination of transport and processing such as the cleaning of railway platforms, lawnmowing, or an activity at the destination site, e.g., coupling trailers, putting on reels. The simplicity of the grid allows these vehicles to be used outdoors especially for transport between buildings, transfer to container terminals, or freight transport at airports.

25059
CSO: 3698/A216

FRENCH MACHINE TOOL PLAN SEEKS BOOST IN FUNDING, R&D

Paris INDUSTRIES ET TECHNIQUES in French 20 May 87 p 27

[Interview of Yves Monnier, President of SYMAP [Association of Machine Tool Assembly and Production], by Michel Alberganti]

[Text] After the disappointments of the French machine tool manufacturers, Yves Monnier's diagnosis points out the weakness of the French market and failure of the machine tool plan in the field of research. Today, however, manufacturers are ready to try. There are already 11 projects. But to implement them requires State participation....

[Question] In 1985 you estimated that restructuring of the French machine tool industry was half way home. Today, what is your diagnosis after a difficult 1986?

[Answer] In 1981 the Machine Tool Plan was counting on a growth in the industrial machine tool investment of 4 to 5 percent per year. In 1981, it reached Fr7.2 billion.

But this figure dropped considerably from 1981 to 1984. In 1986 it rose to 6.7 billion--the amount of 1982--that is, still less than 1981. And 1987 is promising to be difficult....

This continuing weakness in the French domestic market is the primary cause for the difficulties encountered by companies concerned with the Machine Tool Plan. The pickup of sales did not happen, which is why results are falling short of predictions.

In spite of that, French companies have profoundly modernized their products and production facilities.

[Question] In your opinion, what measures could mobilize investments?

[Answer] We have submitted proposals to the Government to increase the demand of the domestic market. We feel that this is the only way for companies to recover their international competitiveness. Investment incentives measures seem to be necessary. For example, accelerated depreciation for the small- and medium-size companies that invest in electronics machine technology. The

period of depreciation is three years in Japan compared to seven years here in many cases. Likewise, we are in favor of the Meca procedure. But the funds available to it have been cut back considerably. The funds will amount to only Fr 60 million in 1987--instead of 70 as planned--as opposed to Fr 130 million in 1985.

[Question] As of 1985 research was considered one of the pitfalls of the Machine Tool Plan. How about now?

[Answer] This is indeed the great failure of the Plan. For example, Italy spends for machine tools research five times more than France through its "Mechanics Technology" project (Fr 270 million between 1983 and 1987). In France, R&D investment in machine tools is only a few million francs. Presently there are three projects, two of which are at a standstill. Only the very high speed machining applied to hard metals is really being pursued by the MFL [French Machines Lourdes] and the Cetim. The objective is to cut machining time to one-fourth and to achieve a surface condition comparable to that obtained with grinding. Another one is the ROLF project [Laser Robot Tool of the Future]. It is under the direction of Cilas-Alcatel, which is being reorganized. The independent machining center project initially handled by Intelautomatisme is currently being resumed by the association of MFL and NUM.

[Question] Do the French manufacturers of machine tools have other projects in reserve and, if so, is there a chance they might materialize?

[Answer] It seems that the Ministry of Research does not intend to discontinue the R&D. As for the industrialists, they are ready. We can already propose 11 valid projects. They are mainly concerned with machining and assembling. For example, there are projects dealing with new-generation units aimed at improved quality and reliability through self-monitoring of cutting tools, self-diagnosing, and expert systems. The incorporation of units in the local networks is also envisioned for research aimed at decreasing costs and increasing reliability and capacity. And, in the field of wood, we have in mind a flexible cutting unit with optimization of material for a saw mill. To that can be added projects connected with new materials; constituents of machine tools using restored granite resins or ceramics. Or projects involved in the machining and cutting of these new materials by means of laser or charged or uncharged fluid jets.

[Question] In these projects, what are the configurations you propose for prime contracting and implementation?

[Answer] Associations are the answer in almost all cases -- sometimes several manufacturers in association. But cooperation with users, engineering firms, technical centers, and universities is also seen as a possibility.

[Question] And in terms of financing?

[Answer] We expect the State to finance 50 percent.

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CSO: 3698/513

BRIEFS

SIEMENS VISUAL ROBOT SENSOR--Siemens AG, Munich/Berlin, with the visual sensor Sirotec VPS (Videomat Programmable System) has created a sensor which according to data provided by the company is said to be usable, because of its broad capabilities in gray-value processing, in handling difficult tasks in the domain of manipulation technique. By means of the Sivips programming system (Siemens Vision Programming System) Sirotec VPS can be freely programmed by the user. Thus the system is usable not only for standard applications, but also for individual tasks. Its areas of usefulness include, besides the traditional tasks assigned to robots, also such tasks as part recognition and determination of part position as well as the measurement of workpiece edges and cutouts, permitting the processing of these workpieces by the robot. In addition, the sensor serves for optical surveillance of the processing steps, checking the correct positioning of the workpieces, and examining them for defects. [Text] [Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 28 Apr 87 p 8] 8008

SIEMENS COMPACT ROBOT CONTROL--Siemens is marketing a compact robot control with the designation Sirotex RCM1K which will be offered, primarily as a result of hardware reduction, at a price below 10,000 marks. In its basic design the robot control offers three servo-regulated axial measuring circuits and is otherwise functionally the same as the already widely introduced Sirotec RCM1 control. At the same time the features of the lower performance range of the Sirotec RCM family of devices has been maintained. This includes the Synchron point-to-point control, the user memory expandable to 6,000 space points, and also includes possible expansion for six axes--according to the reports issued by the company. The control can be changed over to an absolute displacement measuring system. Velocity, acceleration, and overloop behavior are programmable. Via PLC coupling or computer coupling this compact version can also be linked into flexible automation facilities. [Text] [Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 14 Apr 87 p 8] 8008

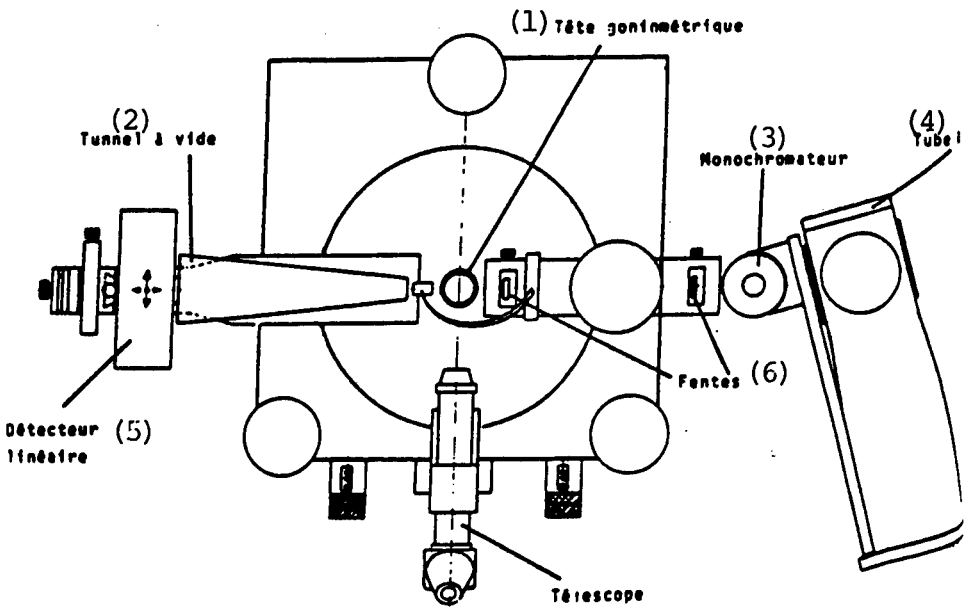
CSO: 3698/481

FRENCH X-RAY FOR NON-DESTRUCTIVE TESTING

Paris AFP SCIENCES in French 23 Apr 87 p 22

[Text] A new piece of equipment for studying the internal structures of all sorts of materials has just been developed in France, in a collaborative program between the Phillips company and the CNRS [National Center for Scientific Research] and ANVAR [National Office for the Advancement of Research] laboratories. Using a horizontal goniometer, the PF 1380, it is now possible to make further advances in the knowledge of the structure of materials in a more precise and rapid manner, pointed out the designers who--at least for Phillips and the CNRS--are working together for the first time on this project.

Overall View of the LASIP equipment



Key:

1. Goniometer head
2. Vacuum tube
3. Monochromator
4. X-ray tube
5. Linear detector
6. Slots

The value of this tool, which uses x-rays as a radiation source, lies in its many different uses. For example, it can be used in research fields as diverse as biology, chemistry, physics and electronics (semiconductors). This new machine is also of interest to high-tech industries and could be used during the production of electronic components in fabrication control.

This piece of equipment costs 650,000 francs. It is the result of about 10 years of basic research by the chemistry coordination lab of Toulouse (Professor Jean Galy) and the solid state physics lab at Orsay (Professor Robert Comes) of the CNRS. Four of these machines, for which international patents have been applied, have already been sold in France and abroad.

"We wanted to develop a forward-looking machine, one that would be as universal as possible and that could respond to new market demands," pointed out Jean Denost from Phillips' science and industry division. The equipment's measurement precision is on the order of 1 angstrom, so it can be used to determine the nature of atoms, the distance between them, and their position in the molecule. This can all be determined very rapidly.

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CSO: 3698/531

BRIEFS

ITALY, JAPAN SHARE STEEL TECHNOLOGY--Deltasider and Daido Steel--companies with 20 percent of NSC participation--have concluded a two-year agreement that provides for the exchange of experience and technology in the special steels sector. The Japanese experience should permit Deltasider to improve productivity and update its range of products by increasing the percentage of those products which are of increased value. Already underway is the exchange of four technical missions in the two areas of experience and technology. The Italian market for quality alloy steel is currently along the order of two million tons per year. Deltasider supplies 40 percent of the domestic demand and exports 15 percent of its production. Investments on the order of 50 billion lira in three years are expected, with the intention of improving the ratio of personnel costs with respect to sales. Daido Steel has about 50 projects for exchanges of know-how currently underway with 20 countries including Germany and the United States. [Text] [Rome BOLLETTINO TECNICO FINSIDER in Italian Mar 87 p 71] 13209/12859

FINLAND: METALLURGY RESEARCH FUNDED--A large program to develop products using powder metallurgy has been begun in Finland. Participants in the three year program are the Center for Technological Development, the College of Engineering, the Tampere College of Engineering and eight private corporations. Forty-seven million markkas has been set aside for the program. Powder metallurgy is a broad field of technology which is characterized by a rapid fabrication of finished products from the raw materials. It is a very expensive production method. Eleven million markkas of the funds for the program came from the research budget of the Center for Technological Development and 14 million from its product development budget. The remainder will be provided by the corporations and colleges. [Text] [Helsinki HELSINGIN SANOMAT in Finnish 30 May 87 p 34] 13002

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CSO: 3698/499

EUROPEAN MARKET ANALYSTS FORESEE SEMICONDUCTOR GROWTH

Duesseldorf VDI NACHRICHTEN in German No 14, 3 Apr 87 p 28

[Article by Gustav Purt: "European Semiconductor Market Remains Stable: Automatic Test Equipment for Chips Lead the Offer"; first paragraph is VDI NACHRICHTEN introduction]

[Excerpts] Zurich, 3 Apr (VDI-N)--Production equipment for the various process steps in the manufacture of megabit memory elements was part of the exhibit presented in Zurich by Semicon with special emphasis on automatic test equipment. It has been said that because of its stability, the European semiconductor market is of great interest to American and Japanese manufacturers.

The 13th "Semicon Zurich '87," an annual event organized by Semi (Semiconductor Equipment and Materials Institute) in six different locations, including the United States, Japan and Korea, took place in the second week of March.

Semi is a trade association representing a large industrial sector [whose business is] worth $8 million and in which roughly 1,200 supply companies for the semiconductor industry participate.

The products of approximately 400 exhibitors were displayed at the Zurich exhibition. A technical symposium was held during this show with emphasis on the individual aspects of advanced manufacturing and test methods in the submicron area, as well as packaging of VLSI and ULSI elements. The Americans occupied more than half of the exhibition area, and organizers counted more than 6,000 visitors.

In the immediate future, the European market is especially interesting for Japanese and American exhibitors because it has not experienced the peaks and slumps which Japan and the United States have encountered in the recent past.

"The stability of the European semiconductor market gives Europe superior market force for its size," declared C. Scott Kulike, who is both the president of Semi and the chairman and general manager of Kulike & Soffa AG, Zug, Switzerland. "In addition, Europe is a very important market for equipment and materials for the manufacture of semiconductors and has made a

considerable contribution to maintaining this industrial sector in the past and will do so in the future."

Relatively large problems, especially for European manufacturers, have been caused by the wildly fluctuating rates of exchange, as Gustav Wirz, head of Alphasem AG, Berg [Switzerland], stated at Semi's annual outlook conference: "The industry is confronted by an increasingly difficult situation, trapped as it is between a weak dollar and a strong yen. Products traded at dollar prices are now competitive, but despite the strong yen, Japanese exporters sell their merchandise here at comparable dollar prices."

"The American-Japanese chip agreement causes additional concern among the members of the EEC. The feeling is that the whole question of a fair price structure should be clarified at government level in Europe as well, and the sooner the better," Wirz concluded.

William H. Reed, managing director of Semi, thinks that "the European semiconductor industry can enjoy a growth rate which the Americans can only envy." The latest market statistics strongly support this statement. Last year, the European market grew by 20.3 percent to a volume of $5.46 billion. For the current year, a growth of 9.2 percent to $5.97 billion is expected, whereas Japan may only achieve a growth of 8 percent, and the United States a growth of only 5.1 percent.

For this year's exhibition much more space was made available for test equipment. This resulted from last year's visitor poll which showed strong interest in the innovations in this sector.

The exhibited manufacturing equipment for the various process steps was aimed especially at the area of submicron technology, which is needed, for example, for the new generation of megabit memory elements.

Emphasis in this area was not only on manufacturing equipment itself, such as the new bonders with computer communications interfaces from Esec AG, assembly equipment from Alphasem AG, Berg, Switzerland, and design equipment from Canon Europe N.V., Perkin-Elmer, or Nanomask SA, Rousset, but also on equipment for the creation and control of the necessary clean room and purity conditions.

Examples [of this equipment] are the particle counting system of Met One Inc., the atmosphere monitoring system of K. Schaefer & Co, Zurich, and the system for purity control in semiconductor materials of Atomika Technische Physik GmbH, Oberschleissheim, as well as numerous optical test devices like that of Temptronic Co (Stolz AG, Baden) for temperature control, the various wafer inspection stations like the one from Aerona Electronics Inc. and the microscopes of various manufacturers, including the scanning electron microscope by Hitachi Nissei Sangyo GmbH, Duesseldorf.

Following Semicon '87 in Zurich, an intensive 1-day seminar took place concerning the practical application of the Semicron Equipment Communications Standard (SECS) for the automation of IC [integrated circuit] manufacturing. The seminar was organized by GW Associates Inc. and the Swiss Esec company. The topics of discussion were the SECS I and SECS II protocols, along with an analysis of communications between machines and control computers in process- and assembly-oriented applications. The requirements of both IC manufacturers and machine manufacturers were considered.

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ITALY'S SGS NAMES CANADIAN FOR TOP POST

Milan AUTOMAZIONE E STRUMENTAZIONE in Italian Dec 86 p 78

["New Top Official at SGS"]

[Text] SGS Microelectronics Inc, of the IRI-STET Group which is among the world leaders in microelectronic technologies, has appointed Murray V. Duffin responsible for the strategic planning and business system functions.

The decision to create this new post, which coordinates strategic marketing, information systems, central quality and external relations, aims at reinforcing two determining factors for the company's development: strategic planning and service to customers, in which SGS aspires to positions of absolute excellence. Murray Duffin, Canadian by birth and a graduate in electronic engineering from the University of Manitoba, Canada, will work directly with the company's top officials.

Mr Duffin has much experience in the world of semiconductors, with a career begun as a designer and continued with an increase in numerous and important functions, always at top management levels. After 17 years at Motorola, where his last assignment was as manager of the Asiatic region for the international division, Mr Murray Duffin was Vice President for product management at General Instruments and finally VLSI operations manager at Matra Harris.

Acquiring Duffin as a staff member, with his vast experience and high professional level, is a significant gain to the managerial assets of the company in Agrate.

In accepting the position offered him Duffin said that he felt confident in being able to make a significant contribution so that SGS would reach, by the end of this decade, its objective of becoming a billion dollar company.

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NEW FRENCH VENTURE CAPITAL FIRM SPECIALIZES IN ELECTRONICS

Paris ELECTRONIQUE ACTUALITES in French 22 May 87 p 24

[Text] The venture capital firm IGF, particularly active in electronics and data processing, is to go public this month on the second market of the Paris stock exchange.

Created in 1982, it now possesses about 10 holdings, notably in Econocom International, GO International, APL Informatiques, Comintel, and Econocom Expert.

IGF invests in companies that are being set up or are in their startup phase, or which are likely to go public very soon, explains its president, Mr Jean-Louis Bouchard. The goal is to accelerate and expand their development. IGF emphasizes that its participation is not only financial, but also covers legal engineering, fiscal problems, strategy, international establishments, etc. "IGF invests in men above all," Mr Bouchard emphasizes.

The company investments, they add, have followed the development of the company's own funds and should be maintained in coming years. IGF's own capital today totals some Fr 154 million (compared to Fr 29.4 million in 1986 and Fr 9.5 million in 1985). At the same time, the net financial investments have gone from Fr 0.6 million in 1985 to Fr 27.3 million in 1986 and to Fr 62.4 million as of 31 March 1987.

Rapid Progression of Econocom

The Econocom group--the pride of IGF--is a grouping of 50 data processing service companies in 15 countries. It concerns itself with maintenance as well as financing, distribution, and location. Its 1986 revenue totals Fr 3.1 billion (up 15 percent). This year Econocom is aiming for a turnover in excess of Fr 4 billion and a net profit of Fr 100 million.

The company's own capital has gone from Fr 241 million in 1985 to Fr 425 million last year, and the personnel from 50 in 1983 to 1100 last year.

"Rapid progression," says IGF, "should continue due to the strong international development of new service activities with a high added value such as maintenance and consulting in auditing and organizational fields."

Econocom should go public starting in 1989 on the major international stock markets, it is added.

Econocom Expert, a subsidiary of Econocom of which some of the capital is held directly by IGF, is a consulting company for data processing management and organization. Created in 1985, last year it achieved a turnover of Fr 9.5 million and a net profit of Fr 3 million.

Comintel, another company that IGF has a share in, specializes in videotex software, setting up of turn-key information retrieval centers, and hosting of "telematic" services. It was created in 1985; this year it is aiming for a Fr 8 million turnover and a net profit of Fr 1.5 million, and expects to triple its sales and profits in the next three years.

APL Informatique, another firm that IGF in recent years has invested in, specializes in designing and building data processing centers and cable networks, in security auditing, and supplying installation kits for small and medium-size systems. Created in 1983 by Mr Gerard du Besset, formerly with Control Data, in 1986 APL realized a turnover of Fr 21 million. Its entry in the second market of the Paris stock exchange is already being considered.

The same goes for GO International, another IGF investment. This computer engineering service company specializing in the fashion and clothing industries, should go public next year. This year GO expects to do a turnover of Fr 56 million (up 70 percent) and a net profit of Fr 4 million (up 50 percent).

Let us also point out that IGF has just added two new holdings: one in Point Compo and the other in Copy 2000, two firms operating in the field of electronic publishing and quick printing.

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SIEMENS CONTINUES DEVELOPMENT OF MEGABIT TECHNOLOGY

Paris AFP SCIENCES in French 5 Feb 87 p 25

[Article: "Siemens Spending Billions for Chip Manufacturing"]

[Text] Munich--To stay in the megabit race, for the past 3 years Siemens has spent hundreds of millions of DM to produce "super-chips," tiny silicon chips capable of storing thousands of pieces of information on a few square millimeters.

After months of efforts, and investments of DM2.5 billion, (800 million in research and development and 1.7 billion in equipment) Siemens has reached the goal of the first stage of its "superchip" program: the mass production of 1 megabit (1 million bit) chips, which having just been launched, will achieve cruising speed next summer.

Thus Siemens is the first European company to produce chips of this capacity on an industrial level. These mini-memories can store the equivalent of 64 typed pages on an area of 54 square millimeters, or approximately one-fourth the size of a small postage stamp.

To implement these programs, Siemens has built a research laboratory at Munich-Perlach costing 600 million DM, and a manufacturing plant at Regensburg in Bavaria at the same cost. Each facility has 4,000 square meters of absolutely sterile rooms where the personnel wear surgical scrub suits, gloves, hats, and masks. Sophisticated filters and pumps circulate 5 million cubic meters of sterile air per hour in the Regensburg facility.

Up to now, only the American computer company IBM has mass-produced 1 megabit chips in the FRG and the United States (since January 1986).

The Siemens 1 megabit chip was developed in cooperation with the Japanese Toshiba company, although manufacturing will be done only at Regensburg. In 1984 Siemens contracted with the Dutch Philips company for the manufacture of a 4 megabit chip, to be mass-produced in 1989, also at Regensburg. Philips also plans to build a manufacturing facility near Hamburg.

According to the experts at Siemens, the manufacturing process for 4 megabit chips requires up to 400 meticulous and complex operations: baking of the

silicon in ovens at over 1,000 degrees, application of extremely thin photosensitive layers to achieve a circuit for which the conductors have a size of 0.8 microns (0.8 millionth of a meter). "We are actually at the fine-tuning stage of the manufacturing process," stated the Siemens project leader.

Siemens has engaged 1,350 people in this technological battle, considered to be decisive for the future. At Munich-Perlach, 390 people, including 300 scientists, work in the largest microelectronics center in Europe.

Siemens estimates that the worldwide market for these components will be approximately DM500 billion between now and the year 2000. "Every 3 years," company officials explained, "a new generation of chips appears on the horizon, capable of storing 3 or 4 times as much information in smaller and smaller circuits, and they are more and more expensive to design and produce."

"Being at the forefront of memory technology is not a goal as such for Siemens. However, memory technology is essential for manufacturing the computer systems we want to sell in the future, which will require unlimited memory capacities," the official added.

However, the chip market is extremely dangerous. Given the rapidity with which chip generations follow one another, the manufacturers have very little time to make their enormous investments profitable before competition causes price cuts.

Siemens is already studying the next generation chip, which will have a capacity of 16 megabits. "With the current design, we can go as high as 64 megabits. We are reaching the physical limits for the size of the conductors on the circuits," a Siemens technician explained.

Siemens could purchase chips elsewhere, for example, from Japanese manufacturers. "Such a tactic would be detrimental to us, because mastery of memory-chip technology will also allow us to master logic-chip technology, that is, mini-circuits for calculation in the computers of the future," he explained.

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BRIEF

FRG:CMOS-CHIP TESTER--Especially for electronic switching circuits with structural dimensions in the submicrometer range the Sentry Schlumberger firm intends to market a universal memory testing device under the designation S90. This machine cycling at 50 MHz has been designed especially for the high-volume production testing of high-performance CMOS memories. The testing of the new 256-kilobyte static read/write memory (SRAM--Static Random Access Memory) or the 1-megabyte dynamic read/write memory (DRAM) will be accelerated by the S90, in the opinion of Schlumberger. It is also asserted that the S90 can at the same time test 32 components in parallel without interfering with the 50 MHz test rate. [Text] [Frankfurt/Main FRANKFURTER ZEITUNG/BLICK DURCH DIE WIRTSCHAFT in German 7 May 87 p 8] 8008

CSO: 3698/481

BMFT PERFORMANCE PLAN OUTLINES EVOLUTION OF R&D POLICY

Bonn TECHNOLOGIE NACHRICHTEN-PROGRAMM INFORMATIONEN in German No 399, 6 May 87 pp 16-22

["Summary and Balance Sheet" of the "Overall Activity Plan of the BMFT [Federal Ministry for Research and Technology];" date of issue not given]

[Text] 1. Fewer Government [Contributions] in Research Subsidies

Research and development in the FRG is not subsidized and managed by one central office but is shared appropriately under the constitution and other laws by industry and government--by the federal government, federal states and private financial backers.

After the government share of research financing increased during the 1970s, it started decreasing at the beginning of the 1980s. Since then, the share of R&D financed by companies has grown. With 60 percent of financing provided by companies themselves at present, the FRG is second only to Japan among the large industrialized countries in this regard. In 1986, total research expenditures in the FRG rose to approximately DM55 billion. About DM33 billion were raised by companies and DM7.4 billion were contributed by the BMFT (see Chart 1). The proportion will probably increase in favor of nongovernment research expenditures. This development corresponds to government policy guidelines.

2. Industrial Subsidies: Financing Adjustments With Decreasing Amounts of Money

Overall subsidies to industry clearly decreased. For every research DM raised by the companies, they received only a little more than 6 pfennigs in BMFT subsidies in 1986. In 1983 it was still 8.5 pfennigs (see Chart 2).

In particular, project subsidies in industry for market-oriented technologies definitely decreased. Their share in total BMFT expenditures decreased from 38 percent to approximately 22 percent. In absolute terms, it was only DM1.6 billion, that is, half a billion less than in 1983 (see Chart 3). Subsidies for market-oriented technologies will constitute a continuously decreasing share of the BMFT budget during the planning period.

Industrial research activities in these technologies have clearly increased because of the awareness of the importance research has for international competitiveness.

In addition to the reduction of government outlays in this area, the focal point of direct subsidies has changed: The new concept of joint research creates the opportunity to enhance cooperation between science and industry. Among the industrial subsidies about 60 percent of the funds for direct project subsidies within the industrial financing of market-oriented technologies is allocated for joint projects. This expansion of joint research means at the same time stronger support of scientific institutions (universities, research centers) within the framework of BMFT project subsidies.

Nevertheless, systematic subsidy may be necessary in order to support development and application of key interdisciplinary technologies for a limited period of time. The BMFT is doing this, for example, in biotechnology, information technology and materials sciences. Although the international challenge in key technologies has been accepted with these programs, it was done superficially. Subsidy of those key technologies in industry constitutes only 37 percent of direct subsidy for industry in market-oriented technologies. The remaining amounts are allocated for infrastructure technologies within the framework of government activities, primarily energy (coal, nuclear and regenerative energy technology) and transportation technologies.

3. Equal Rights for Small and Medium-Sized Firms in Research Policy

The indirect subsidy of research has become much greater during recent years. BMFT subsidies in this field have almost quadrupled between 1982 and 1987. Indirect-specific subsidies within the framework of the specialized programs in which large numbers of small and medium-size companies participate have doubled, from DM87.5 million in 1982 to approximately DM197 million in 1987 (see Chart 4).

An examination of subsidies to medium-sized companies as part of the research policy must include all FRG civil research subsidy. Considered in this light, small and medium-sized companies receive twice as much funding for R&D per DM of self-financing for research as large companies based on their own expenditures for research.

Specialized, non-bureaucratic methods used in indirect and indirect-specific subsidies, in particular, made achieving this primary objective of the new orientation in research policy possible. Certainly no claim of discrimination against smaller companies can be made. This change has not been achieved through increased subsidies to industry, but through the consistent reduction of subsidies especially to large companies. This change did not occur because of increased reinforcement of research subsidies to industry, but through a decrease of government influence, as described above.

Even when BMFT research subsidies are examined individually, there is no longer any sign today of discrimination in research policy against smaller firms:

Between 1983 and 1986 BMFT R&D subsidies for large companies were reduced by 21.2 percent while subsidies for small and medium-size companies increased by 18.7 percent.

4. New Subsidy Profile: More Basic Research, Fewer Market-Oriented Technologies

In research subsidies, the BMFT has five main tasks:

1. Subsidy of basic inter-program research by subsidizing the Max Planck Society and large-scale projects in basic research and their related infrastructure as well as the humanities and social sciences;

2. Subsidy of long-term government programs characterized by high risk and long-term perspectives. Included in this are space research, ocean and polar research, and nuclear fusion research;

3. Subsidy of preventive research, including primarily health, environmental, climate and ergonomics research;

4. Subsidy of market-oriented technologies, that is, energy technology and key technologies such as biotechnology, information technology and materials research;

5. Contributions to the improvement of basic conditions and requirements for commercial innovation, particularly in small and medium-sized companies.

As indicated above, the subsidy of market-oriented technologies has clearly decreased, both in comparison with other research subsidy tasks and in absolute terms. The BMFT activity profile (Chart 5) reveals that there has been a reduction of the BMFT budget for this from more than 53 percent in 1981 to an estimated 43.4 percent in 1987, although the total BMFT budget has increased by almost DM600 million over the same period. The higher dynamics of research in industry have increasingly provided the possibility to deal with urgent government measures for scientific subsidies, preventive research and other areas. It is obvious how it was possible to strengthen these activities within a reasonable time frame without an excessive expansion of the total budget. The importance of preventive research and long-term programs among BMFT tasks is going to increase according to the plan in the years to come.

This is especially true for basic research, which particularly benefits from the development described above. Basic research, i.e., research which does not aim at concrete specific research goals, but serves primarily to expand our understanding and basic scientific knowledge, is being subsidized by the BMFT in various ways (see Chart 5, shaded areas):

--First, there are funds available for basic inter-program research outside the special BMFT programs: subsidies for the Max Planck Society, for large-scale projects in basic research and associated research institutions, and for the humanities and social sciences. Decisions on a new generation of large-scale projects (among others, HERA, SIS, KTB, ESRF), with a BMFT subsidy

totaling DM3.6 billion, have been made in this area since 1982. In addition, the humanities and social sciences received new incentives from the BMFT through new thematic projects and considerably increased funds.

--Second, projects for basic research within the special BMFT programs are also subsidized, for example, extraterrestrial basic research within space research, basic problems of solid state physics within information technology and fundamentals of molecular biology within biotechnology. The intensification of basic research with a corresponding decrease in subsidies for industry will be the main priority of a more extensive plan for the support of information technology currently in preparation.

Of the total 1982 BMFT budget, the proportion devoted to basic research was approximately 26 percent. However, this share was already about 32.2 percent in 1986. The ratio of market-oriented technology subsidies (excluding basic technology) to basic research, which was approximately 2:1 in 1982, was nearly 1.2:1 in 1986 and will continue to move to this direction (see Chart 6).

5. Reorientation Toward New Research Areas

In addition to the sustained and clear intensification of basic research as a task of government research subsidies, a breakdown of the budget by subsidy priorities gives a clear picture of the thematic priorities which have been set within the research policy (see Chart 7):

--Decrease in areas where research problems are no longer considered a priority. This was the case primarily in the energy area due to the expiration of demonstration projects for advanced reactor projects, but also in the area of road and rail transport.

--Reinforcement either in areas which are of great importance for the future as interdisciplinary key technologies, like biotechnology and information technology, or in which actual research problems and our understanding of tasks in our economic community require government action, for example, for study of damage to forests, climate research, ecological research, environmental technology and health research.

Restraint in market-related areas has up to now made possible the necessary expansion of space research. This research area offers promising prospects for basic research, industrial applications (already seen in the area of telecommunications), preventive activities (climate research, environmental observation) and international cooperation. Because of the importance of space research, the federal government has made the following long-term decisions:

--Participation in the preparatory phase of the European ARIANE V launcher;

--Participation in the preparatory phase of the planned space station COLUMBUS;

--Participation in the definition phase for the planned European shuttle HERMES;

--Further measures for the reinforcement of European autonomy in space research within the ESA [European Space Agency].

International cooperation is becoming increasingly important not only in space research, but also in other scientific and technological areas. This is expressed both through government initiatives--such as the definition or recognition of standards--and also through the cooperation between companies and research institutions, as emphasized, for example, in the EUREKA program.

6. New Approaches Involving Non-Monetary Measures

Financial subsidies for research are certainly an important element but do not reflect the totality of research policy. Of at least equal importance are non-monetary components such as the simplification of administration, maintaining a climate which favors and stimulates research, and communication between experts and the public for objective discussions of problems and reduction of prejudices. The issues arising from the analysis of the consequences of technology accompanying technical-scientific progress are also becoming increasingly important.

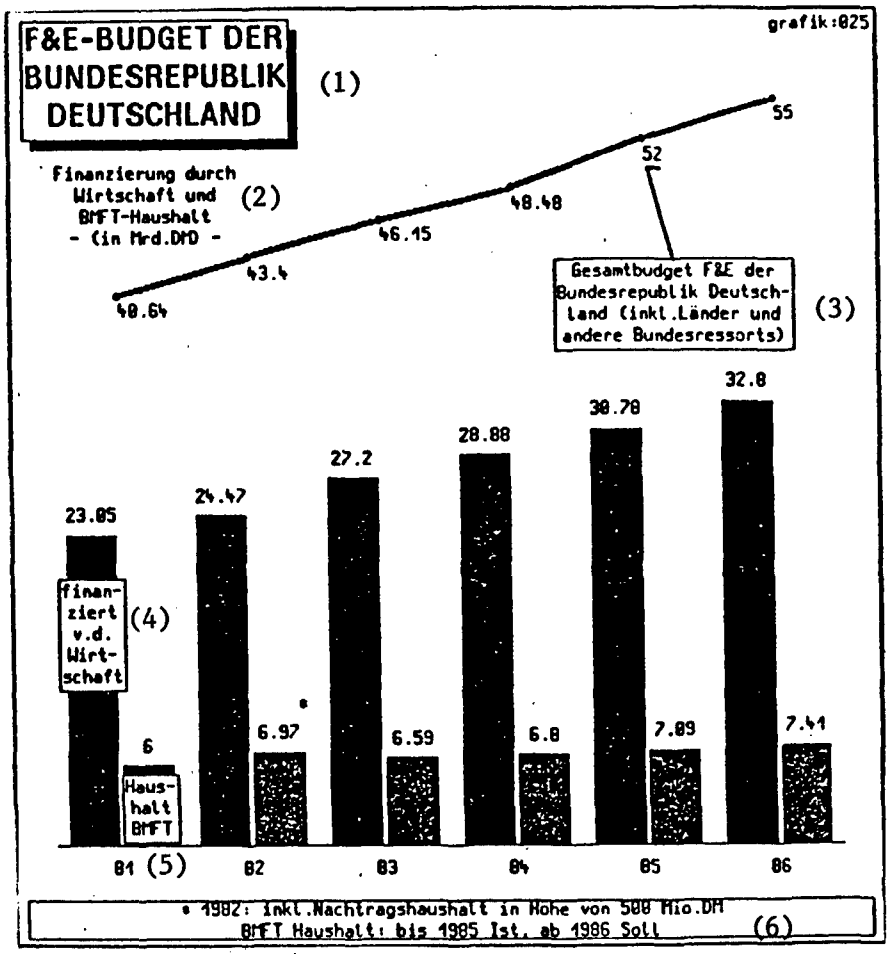
It has become clear in recent years that the examination of risks and consequences of technological and scientific progress is not a secondary element of research policy. This conclusion has resulted from comprehensive scientific studies regarding the consequences of modern technologies for the work place, from the appointment of the Benda commission to study the issue of legal requirements for regulation of new biological technologies and also from the organization of problem-oriented research such as the problem of forest damage. Risks, and opportunities, must be clearly seen and understood. This is the prerequisite for their development in an open, democratic society.

One of the important tasks in research policy was the thematic reorientation of the subsidy for research institutions, which constitutes approximately one-third of the BMFT budget. This amount consists primarily of basic financing for the 13 large research institutions (see Chart 8).

After the successful conclusion of the initial research, the objective in the early 1980's was to allow a new orientation. The reduced dominance of energy research created opportunities for a stronger turn toward research cooperation with companies, for research activities in the area of governmental preventive measures and long-term programs and for basic research with large-scale equipment.

In comparison with the expansion in these three areas, the share of market-oriented research also decreased in the large research centers. It will continue to be an important part of activities but will obtain a new thematic structure directed toward new, innovative themes such as materials research, information technology, micro-manufacturing, manipulation technology, underwater technology and biotechnology. Therefore, for the large installations, a comprehensive new thematic orientation was introduced. The objective is that large research institutions--as in the past--will make significant contributions to achieving the goals of research policy.

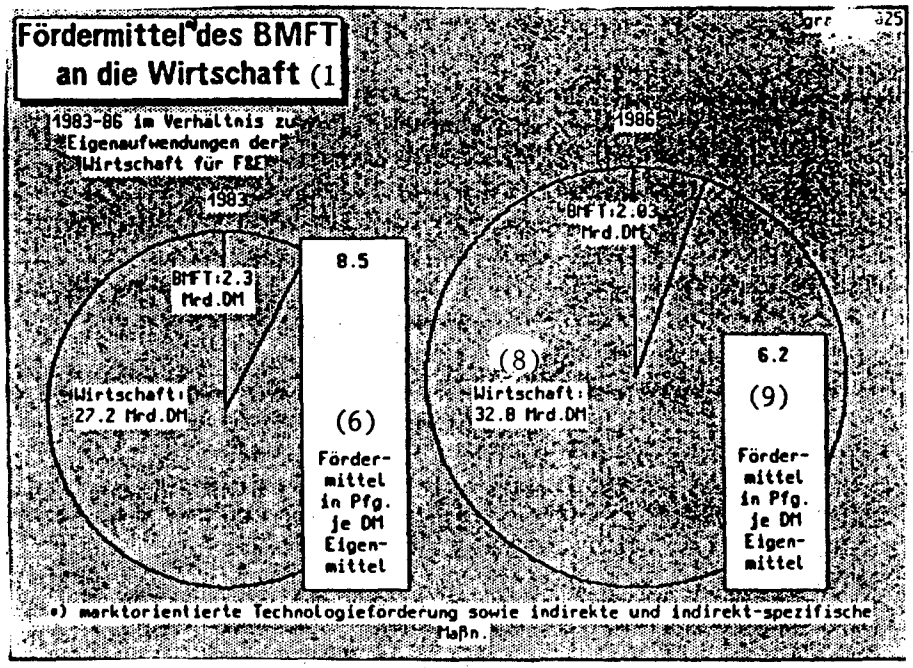
Chart 1



Key

1. R&D Budget of the FRG
2. Financing by industry and BMFT budget (in billions of DM)
3. Total R&D budget of the FRG (including federal states and other federal departments
4. Financed by industry
5. BMFT budget
6. 1982: including supplementary budget of DM500 million
   BMFT budget: up to 1985 actual figures, from 1986 projected figures

Chart 2



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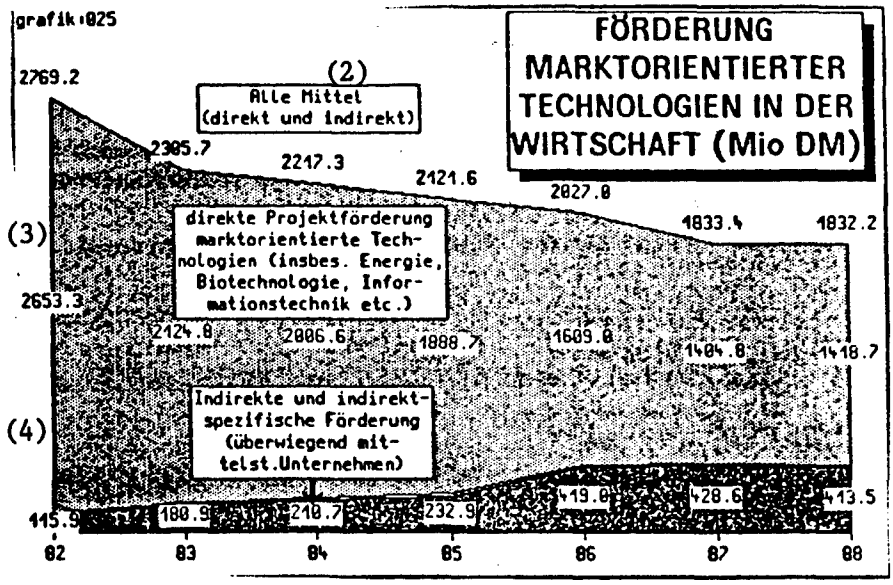
Key

1. BMFT Subsidies for Industry and Trade
2. 1983-86 comparison with the R&D self-financing by industry
3. BMFT: DM2.3 billion
4. Industry: DM27.2 billion
5. *)subsidies of market-oriented technology and indirect and indirect-specific measures
6. Subsidies in pfennigs per DM of company funds
7. BMFT: DM2.03 billion
8. Industry: DM32.8 billion
9. Subsidies in pfennigs per DM in company funds

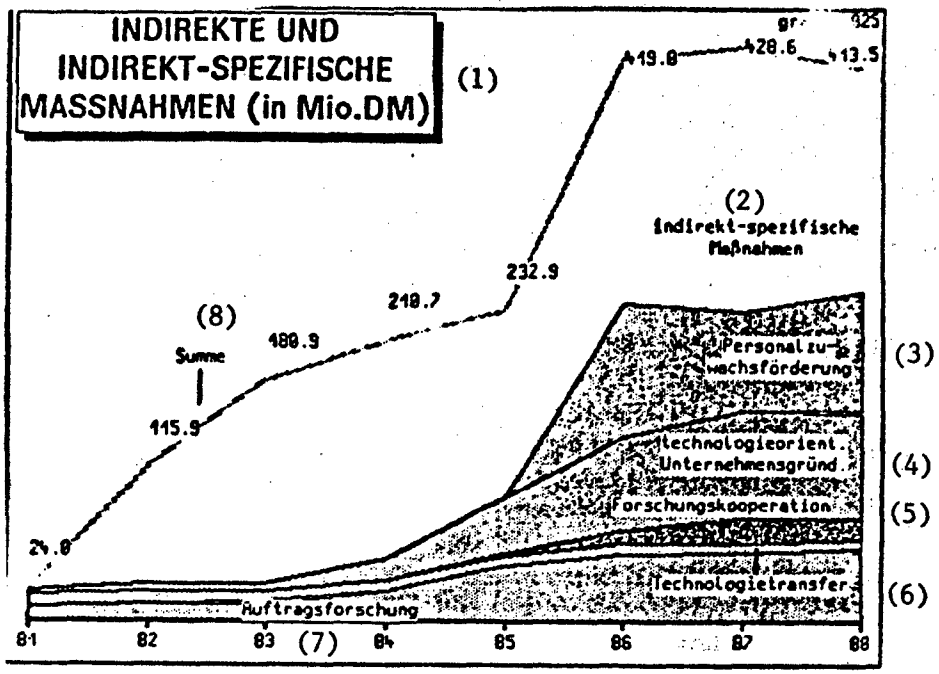
Chart 3



Key

1. Subsidies for Market-Oriented Technologies in Industry and Trade (millions of DM)
2. Total funds (direct and indirect)
3. Direct project subsidies for market-oriented technologies (particularly energy, biotechnology, information technology, etc.)
4. Indirect and indirect-specific subsidies (mostly middle-sized companies).

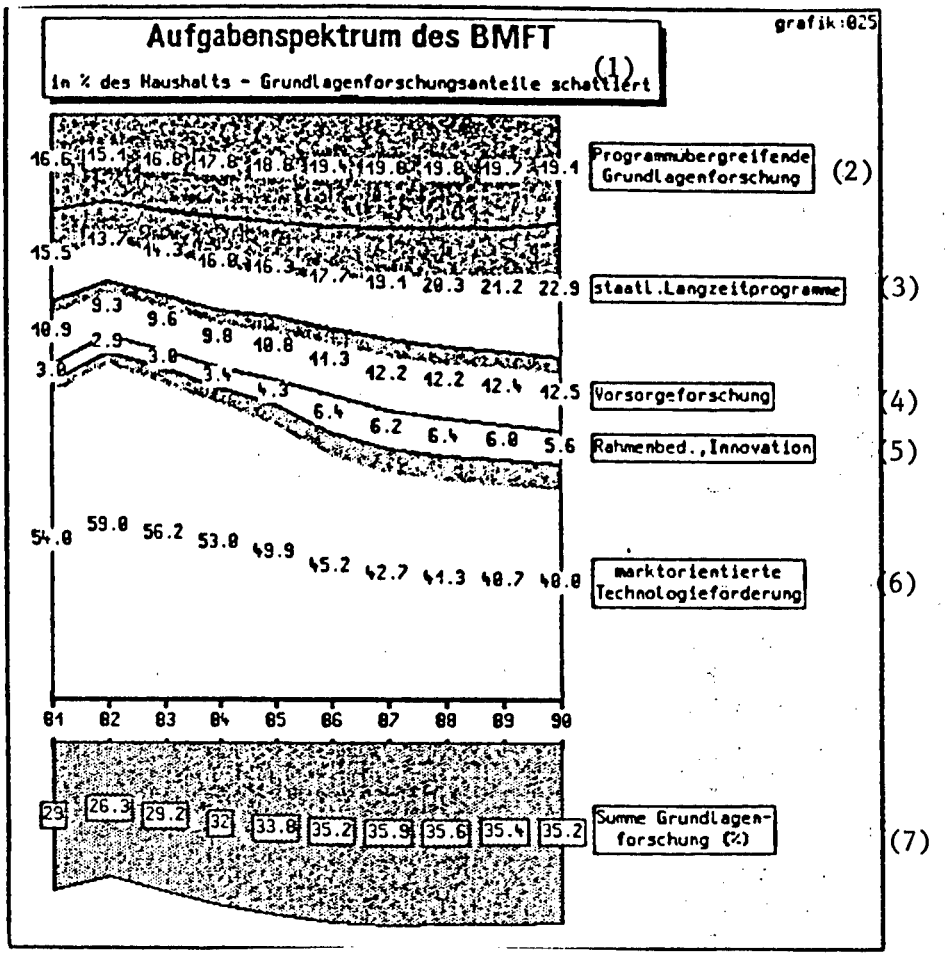
Chart 4



Key

1. Indirect and Indirect-Specific Measures (in millions of DM)
2. Indirect-specific measures
3. Subsidy for increases in personnel
4. Establishment of technology-oriented companies
5. Research cooperation
6. Technology transfer
7. Subcontracted research

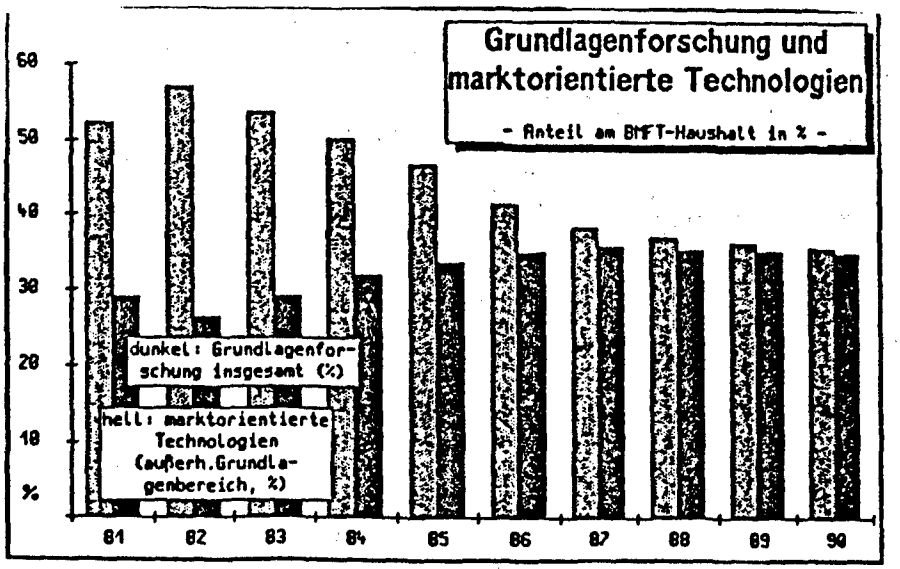
Chart 5



Key

1. Spectrum of BMFT Tasks
   Budget percentage--basic research shares reported in shaded areas
2. Basic inter-program research
3. Long-term governmental programs
4. Preventive research
5. Basic conditions, innovation
6. Subsidy for market-oriented technology
7. Total basic research (percent)

Chart 6



(1)

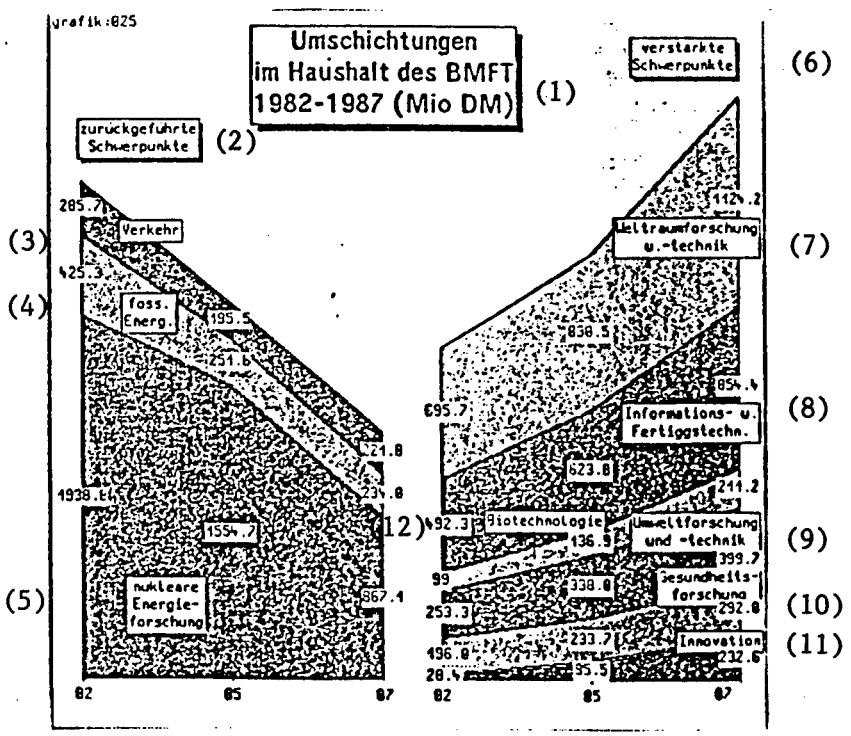
(2)

(3)

Key

1. Basic Research and Market-Oriented Technologies
   --Percentage share in the BMFT budget
2. Dark: total basic research (percent)
3. Light: market-oriented technologies (excluding basic area, percent)

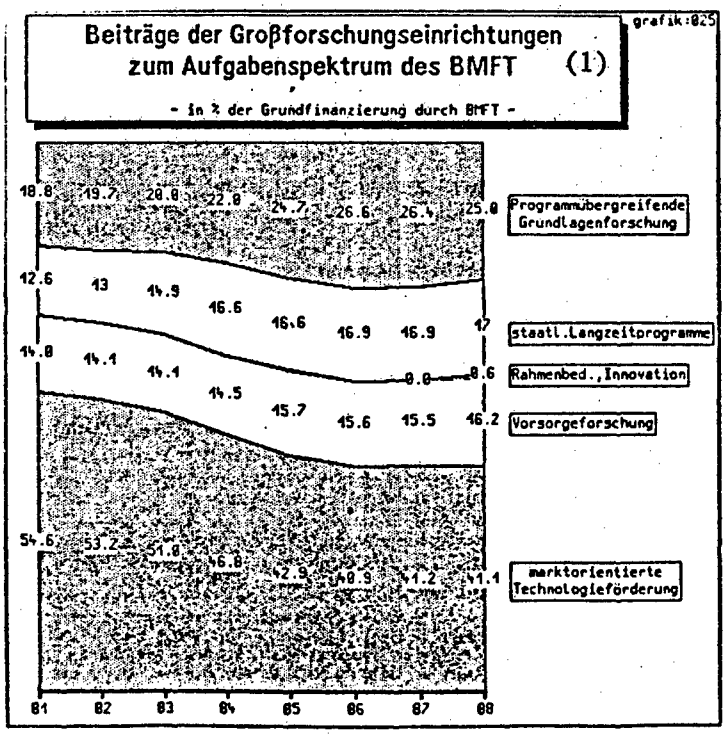
Chart 7



Key

1. Shifts in the BMFT Budget 1982-1987 (millions of DM)
2. Decreased priorities
3. Transportation
4. Fossil energy
5. Nuclear energy research
6. Increased priorities
7. Space research and technology
8. Information and manufacturing technology
9. Environmental research and technology
10. Health research
11. Innovation
12. Biotechnology

Chart 8



Key
1. Contributions of Large-Scale Research Institutions to the Spectrum of BMFT Tasks--as a percentage of the basic financing from the BMFT
2. Basic research in interdisciplinary programs
3. Long-term governmental programs
4. Basic conditions, innovation
5. Preventive research
6. Market-oriented subsidy for technology

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FRENCH EVALUATION OF BRITISH R&D POLICY

Paris CPE BULLETIN in French Feb-Mar 87 pp 55-58

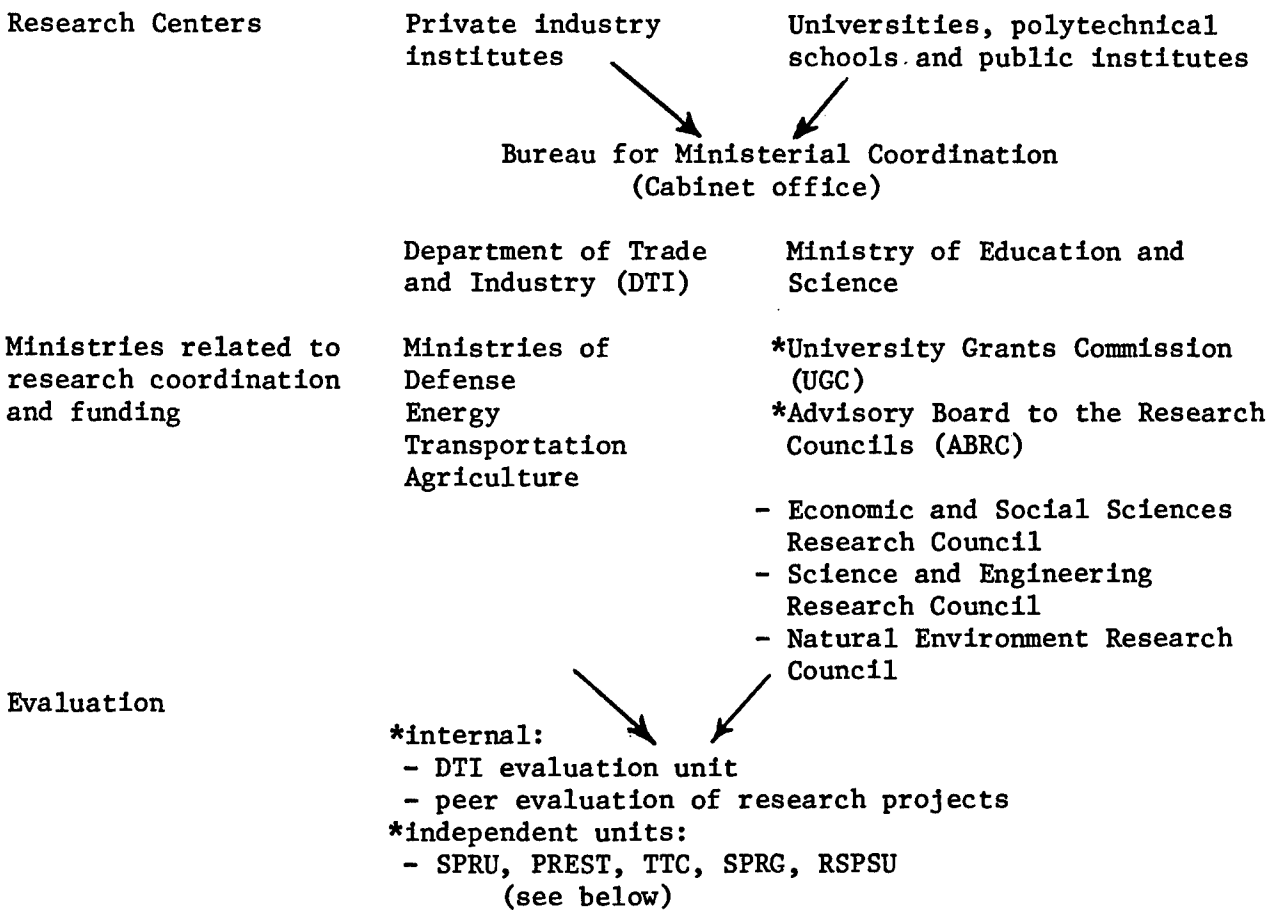
[Article by Mark Booth and Philippe Montigny: "Evaluation of British Research"]

[Text] This introduction to the evaluation of research in the UK consists of two parts:

--a presentation of the major research bodies for research evaluation;

--a presentation of the principal research trends, especially of what is called the "research privatization" policy in the UK.

Analysis of Research Centers and Evaluation Mechanisms



Research Centers

Research centers are divided into two groups: public and private. However, as we will see, this separation is complicated by a "privatizing" trend aimed at better integrating industrial research into universities.

Governmental Research Coordination Structure and Funding Allocation

Although some ministries subsidize research within their own areas (Defense, Energy, Transportation, or Agriculture, for instance), only two ministries monitor the orientation of British research, namely the Department of Trade and Industry (DTI) and the Ministry of Education and Science which is responsible for the structure of the research councils (ABRC).

The government recently established an office above the ministries and research councils: the Bureau for Ministerial Coordination, headed by Vivian Brown. The bureau's task is to provide a comprehensive evaluation of research orientations and spending and, if necessary, to reorganize R&D. As it was created only last year, it is too soon to see the results of this initiative. R&D is still largely determined by each ministry's autonomous policy, influenced by budget allocations and government decisions.

The Advisory Board to the Research Councils is part of the Ministry of Education and Science. Composed of research council heads and independent individuals, it serves as the link between the ministry and the research councils. It is in charge of information on innovation policy, R&D orientations and the budget. It is this council that strongly protested against budget restraints imposed on public research by the current government, and it has commissioned studies by the Science Policy Research Unit (SPRU) and the Royal Society Policies Studies Unit [RSPSU] on the decline of British research. Referring to these studies based on quantitative techniques, it has argued for an increase in the ministry's funds.

The research councils are specialized: science and engineering, natural environment, social and economic sciences, food production. They provide the link between research institutes on the one hand and government and administrative structures on the other. For instance, the Science and Engineering Research Council (SERC) is in charge of the UK's contribution to CERN [European Center for Nuclear Research], universities and university laboratories, research training for students, funding allocations for the proposed projects and orientation of basic or industrial research considered necessary for the nation. Evaluation of these tasks was traditionally based on peer evaluation techniques, but recently more sophisticated techniques have been used to assess the level and quality of their research and to present it to the government in a more structured manner.

Evaluation Units

Each ministry uses its own evaluation service to determine such things as the profitability of its spending or the foreign trade situation. However, at least one ministry, the DTI, has established a specialized evaluation unit,

headed by Brian Avery. For the DTI, it is no longer a matter of just watching trade balance figures, as in the past; they are responsible for the whole process linking research, innovation, production and distribution. Moreover, in promoting ALVEY, a program coordinating joint research efforts by data processing companies, the DTI has created its structures and called on the SPRU and PREST, two university-based evaluation units, to evaluate ALVEY's development in real time.

SPRU: The Science Policy Research Unit is located at the University of Sussex. Thanks to the contributions of Ben Martin and John Irvine, this unit has developed tools to evaluate the number of publications and peer and magazine citations, as well as methods for communication between researchers and users, especially manufacturers.

RSPSU: The Royal Society Policies Studies Unit under Peter Collins recently completed an evaluation of national performance in pure research, using improved bibliographic statistics.

PREST [Program & Policy Research in Engineering, Science, and Technology]: Located at the University of Manchester and directed by Professor Gibbons, this unit is concerned with the structural analysis of the subject under evaluation.

TCC: The Technological Change Center is a private company involved in the problems of disseminating applied research in the new technological fields, and it is also interested in technology's social and economic consequences. John Irvine became one of its directors a few months ago.

SPRG: The new Science Policy Research Group is currently led by John Ziman and Peter Healey. Their ambition is to coordinate the work of experts specializing in the study of R&D system models and R&D orientation.

Trends in Research and Research Evaluation

Three important characteristics of British research have caused increased evaluation efforts in this country. First of all, the UK faces a difficult financial situation. Research costs increase with costs of production equipment, the sophistication of the developments, and the increasing rate at which technology becomes obsolete. In view of this situation, the following have become more important than ever in determining scientific orientations:

-- a prospective analysis of scientific and technological areas to identify the profitable or leading sectors;

-- the determination of criteria making it possible to choose the best project from the many proposals or to reject a research topic.

Up to now, such analyses were based on the opinion of "peers"; however, the current goal of evaluation is to discover other techniques, in particular quantitative techniques.

Second, there is an effort to form a more comprehensive view of the various research fields, whether at the industrial or institutional level, at the national or international level. This phenomenon is already apparent in the Cabinet Office's ministerial coordination, in the DTI effort to study the whole process of production, in the SPRG effort to draw up an R&D system model and, in general, in the various performance evaluations of the nation's research.

Third, there is an attempt to "privatize research." Since 1981 the government has reduced public sector research spending in the hope that private industry would take over. In fact, between 1981-1982 and 1986-1987 industry paid four times more for university research, increasing its investment from 26 million pounds to 100 million pounds.

The effects of this investment are as follows:

-- In addition to the traditional forms of support, such as financing a building or a laboratory or paying professors' salaries, support can also take the form of short-term R&D contracts. ICI for instance is using the chemistry laboratory at the University of Manchester to speed up its research on products using liquid crystals destined for the electronics industry.

-- Influence of industry on course content and on student training. Plessey, a data processing company, is funding the new science and technology institute laboratory in Manchester, but also has a say in course content in order to make the students more competent in both the fields of information system design and in programming.

-- The creation of 26 scientific zones within universities involving 380 companies. Almost all departments have an industrial "liaison officer," but create their own companies and register their own patents to profit from their research.

These recent experiments are leading to many evaluations in Great Britain. They constitute a new field of analysis to evaluate evaluations which deserve our attention.

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PHILIPS PRESIDENT CALLS FOR EUREKA MULTIMEDIA PROJECT

Amsterdam COMPUTABLE in Dutch 3 Apr 87 p 2

[Article: "Van der Klugt at `Competition and Cooperation' Congress: European Cooperation is an Absolute Necessity"; first paragraph is COMPUTABLE introduction]

[Text] Groningen--"If Europe is to avoid dropping into third place in the industrialized West, cooperation between European companies is an absolute necessity," said Philips President C.J. Van der Klugt at the "Competition and Cooperation" Congress recently organized by the Business Administration Department of the State University in Groningen.

Van der Klugt observed that rapid technological developments in electronics require a strategy in which intercompany cooperation plays an important role. This statement was based on a number of factors. First, he pointed to the importance of joint ventures and takeovers to acquire a position on strategic markets. Van der Klugt cited as an example Philips' participation in Grundig which supported the acquisition of a strong position on the West German market.

Synergy

Van der Klugt also emphasized synergy--"cooperation between complementary partners which results in a whole that is greater than the sum of the parts"--and scaling up. In fact,the Philips top executive considers national settings "too narrow" for the electronics industry. "In many cases only large-scale operations can succeed."

As a fourth factor Van der Klugt explained that cooperation can reduce costs and risk, which, in his opinion, can be seen in the Philips-Siemens cooperation in the Mega Project, a technology "for the manufacturing of the future generation chips." Finally Van der Klugt pointed out that new standards can be developed through cooperation.

Subcontractors

Van der Klugt cited a number of ways to obtain cooperation. Cooperation can be bilateral, as in the Mega Project, or can involve several partners. Other

possibilities include precompetitive research in information technology (ESPRIT) and cooperation in the framework of EUREKA, which involves European countries beyond the EEC borders.

Van der Klugt also mentioned the importance of cooperation with subcontractors for the electronics industry. "In electronics coproduction has become essential for competition. It is a shame that subcontractors of a sufficiently high quality in certain technologies are hard to find in the Netherlands and West Europe in general. In this regard, Japan is better off."

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BRIEFS

FRG-FINLAND RESEARCH COLLABORATION--According to Dr Albert Probst, state secretary of the Federal Republic of Germany's Ministry of Research and Technology, the positive offers of collaboration by Finland have been welcomed. Probst, who spoke Tuesday in Espoo, at the annual meeting of the German-Finnish Chamber of Commerce, said that such collaboration still requires initiatives directly from the business and scientific communities to seek foreign partners for joint ventures. Probst said that the FRG government is also prepared to support future pan-European research projects and to improve conditions for cooperation. "The government of the FRG can, however, merely encourage and support such projects but not actually conduct scientific and technical research," observed Probst. Probst expanded on the role of the FRG in European research cooperation. He considered Finalnd's participation in the twelve Eureka projects, with a total value of about one billion markkas, to be particularly significant. This annual meeting of the German-Finnish Chamber of Commerce selected a new president for the organization, the former chief director of Kymi Inc, the honorary industrial counsellor Fredrik Castren. [Text] Helsinki HELSINGIN SANOMAT in Finnish 20 May 87 p 35] 13002

FINLAND-INDONESIA COOPERATION PLANNED--Finland and Indonesia are about to sign an agreement for economic, industrial and technological cooperation. Negotiations will be held in Djakarta May 11 - 13. Finland's delegation will be led by undersecretary of state Paavo Kaarlehto. It is intended that the resulting agreement would then be signed in June during minister Ginandjar Kartasasmita's visit to Finland. [Text] [Helsinki HELSINGIN SANOMAT in Finnish 20 May 87 p 34] 13002

UK'S LINK PROJECT--The British Government's desire to stimulate transfer between university research centers and companies has given rise to a program involving all fields of technology, with 420 million pounds to be spent over 5 years. Project selection will be based on prospects for industrial and commercial development offered by the market, and the government's share in funding will be 50 percent. The LINK project, based on the strengthening of ties between industry and university research, is expected to identify a certain number of market niches where British high-tech industry would stand a chance of prevailing against international competition. This approach, similar to the European EUREKA project which directs research on the basis of application requirements, should allow the government to better evaluate the contents of British industry's R&D programs. Twenty-seven research projects (list available upon request) have already been identified and a meeting on this subject uniting manufacturers, universities, and government officials is scheduled for 1987. [Text] [Paris CPE BULLETIN in French Feb-Mar 87 p 18] 25048

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EDITORIAL ON DISCRIMINATORY NATURE OF COCOM REGULATIONS

Amsterdam COMPUTABLE in Dutch 27 Mar 87 p 3

[Text] In practice, COCOM regulations--which were reported on in the previous issue of COMPUTABLE--seem to be a complex set of arbitrarily applied rules. COCOM export restrictions are motivated by "strategic interest," but interpretation of this concept seems to differ completely from one country or company to another . IBM (through IBM Austria) can offer an official East Europe price list for all its PC's, including the 30-MB PC-AT3 with hard disk (running MS-DOS 3.2 or Xenix), whereas Tulip again pointed out at the Hannover Fair that it could not export such powerful PC's to the USSR despite its advanced business contacts with Moscow.

At the Leipzig Fair, Rank Xerox showed a comparable PC and laser printer; in addition, it has already had MS-DOS (version 3.1) translated into all East European languages, including character change facilities for countries using the Cyrillic alphabet. Of course, computer manufacturers behind the Iron Curtain are not sitting still.

At first glance, their technology seems to lag behind "ours." Their homemade machines have mostly 8- and 16-bit processors, which are not as good as an 80386, for example. However, 32-bit processors (compatible with the DEC VAX, according to the USSR are also highly developed in the Soviet Union. Of course, much of the more advanced equipment was not shown at the Leipzig Fair, and companies such as the GDR's Robotron, with machines also accepted in the West, and Hungary's Videoton should not just be written off as uninteresting.

CEMA countries would like to reduce computer illiteracy, but nonetheless seem to fear an overly informed public. This is a choice they will have to make for themselves. East Europe's economic infrastructure, which makes it difficult to purchase large quantities of quality equipment from the West, is also "their" problem. However, a free exchange of technology which could be considered of "strategic importance" only by a variety of contrived arguments would be considered of "strategic importance" only by a variety of contrived arguments would be a positive development for Western business. A number of companies (such as Rank Xerox) have already discovered this vast unexplored market. Thus far COCOM regulations--because of their wide range of interpretation--seem to contribute greatly to the unequal chances of Western companies to actively penetrate that market. Impressions from the Leipzig Fair certainly reinforce the importance of uniformity in setting and applying export regulations.

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BRIEFS

WARTSILA ENGINE PLANT IN USSR--Wartsila will be building a diesel engine plant in Leningrad. The agreement signed Monday in Moscow is worth over one billion markkas. The factory will be built jointly with Finn-Stroi. Negotiations began in 1983 and ended Monday and were difficult at times. The Soviet party to the agreement is V/O Avtopromimport. The agreement covers manufacturing of Wartsila's diesel engine, Vasa, designing of the factory, shipping of machinery and instruments, as well as construction of the plant. The factory will produce its first diesel engine at the end of 1990. Production will initially be 100 engines per year but, with expansion of the factory, it is projected to reach 400 engines per year in the early 1990's. The factory will produce Wartsila's Vasa 22 and 32 medium speed diesel engines, which are used by ships as their primary and auxiliary engines. The USSR has already purchased about 1,000 such engines from Wartsila. Wartsila's managing director, Tor Stolpe, calls this a new form of joint operations between the two countries. Wartsila will completely design the factory and will supply equipment withing the framework of the bilateral trade agreement. According to the Wartsila plan the USSR will purchase some of the equipment elsewhere. By the end of the year the project will employ about 200 people, at its peak about one year from now roughly 600 will be employed in Leningrad and another 1,000 in Finland. Part of the license agreement is that Wartsila will share new results in diesel engine development with the Soviets. Wartsila already produces the same engine under license in, besides Finland, South Korea, Brazil and Indonesia.
[Text] [Helsinki HELSINGING SANOMAT in Finnish 2 Jun 87 p 25] 13002

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NEW CZECHOSLOVAK AIRCRAFT FOR USSR LOCAL TRANSPORT

Prague TECHNICKY TYDENIK in Czech No 9, 24 Feb 87 p 3

[Article by Miroslav Suchanek: "Aircraft From Computers--The L-610--The Production Program of the Let Aircraft Factory in Kunovice Through the Year 2001"; first paragraph is TECHNICKY TYDENIK introduction]

[Text] Everyone at Kunovice says it is so: The new L-610 aircraft was computer-designed. It is literally true, but do not believe it completely. Everything was done by people who are thinking of tomorrow.

In the Cockpit of the L-610

It is sufficient to negotiate a small stairway and to bend the head a little upon entering the aircraft. Greenish-yellow light softly fills the area with two rows of seats. The aisle is precisely in the center. The cockpit for the pilots is located behind a light wall made of sophisticated alloys. Instruments blink from various sides; control columns are within the reach of the pilots, as are four on-board computers. The view from the cockpit is marvelous and can be even further enhanced by the randomly adjustable attitude of the seat. This is achieved by exerting a slight pressure upon a small plate located in the left armrest. Is everything in order? So the next order of business is starting the engine. However, the two 5-bladed propellers remain at rest. The new aircraft is, thus far, a mockup without wings, even if everything else, including the interior, is offered in full completion.

A few steps further, in a spacious assembly building, the components for the production of the wings are lined up in precise order. The shape of the wing is made perfectly obvious from viewing them.

With its dimensions and performance, the new aircraft will outdo anything that has ever been produced at the Let Kunovice Plant. Thus, it is not surprising that to determine the level plane in producing the wings and fuselage, to facilitate their precise dimensioning and balancing, it was not enough to use a beam of light but a laser had to be used, whose lines are absolutely precise. These characteristics will also show up in the future aircraft.

Dimensions, Mass, Performance

The chief of developmental design, Eng Jaroslav Vrana, says "the wingspan is precisely 25.5 meters and the length of the fuselage 21.4 meters. The height of the aircraft is 7.6 meters, its mass is 14,000 kg. The performance of the engines with their 5-bladed propellers is 1,360 kw. Cruising speed is 400 to 490 km/hr, range is 2,400 km. Cruising altitude is 7,200 meters. This is why the new aircraft has a pressurized cabin. We will be producing this aircraft in three basic variations. As a commercial aircraft for 40 passengers; the second version is designated as a mixed-purpose aircraft and anticipates 16 passengers and 3 pallets of cargo; the transport version carries 6 pallets of cargo without any passengers. We are even contemplating modifications in other variations which have been proven in producing the L-410 aircraft which is currently in production. These are variations of service aircraft, aircraft for photogrammetry, rapid health assistance, as well as aircraft with a ski undercarriage in place of wheels. In the L-610, the 2-member crew is augmented by a flight attendant who even has a small kitchen in the rear of the aircraft."

All of this indicates that the aircraft is intended for so-called small transportation--in other words, flights along local lines, primarily in the Soviet Union. Specifically, this means that the aircraft operates from a local base and airfields in the vicinity which are in the immediate vicinity of extraction towers and similar isolated work sites. The distances from the base to these airfields are literally designated as being "elastic," because they are determined primarily by two factors: the possibilities presented by the aircraft and the requirements of the work site. The proven L-410, which continues to be manufactured at the Let Kunovice Plant, is operating on short hops in Yakutsk at temperatures of -45 degrees Centigrade; it also operates in areas where the standard temperature on a normal day is 50 degrees Centigrade.

The new L-610 will bring greater transport opportunities to these lines and, primarily, will make its contribution through the unique economy of operations. In comparison with the present time, it consumes half the fuel per person and kilometer of flight. Finally, this aircraft will operate on short take-off and landing runways, for which Kunovice is building the most recent variation of the L-410--Model UVP-E.

The Computer and People

At this point, the question becomes compelling as to how all this was achieved. The chief of technical-organizational development, Eng Jiri Balsik, speaks of the computer whose program today holds the entire design of the new aircraft.

It is sufficient to tap out the appropriate command on the keyboard of the computer and an illustration of the selected component, cross section, or the entire fuselage of the aircraft appears at the terminal. On the screen, a small arrow blinks and the computer draws the selected component. It is possible to transmit its complicated shape in an instant to the drafting machine which produces a classic technical drawing of the desired scale. It is also possible to simulate various types of stress on the screen of the

terminal--stress to which the design is subject during actual flight. That which fulfills the most optimal of conditions is then selected for production. It is phenomenal progress.

"The necessary component can be called up on the screen at any time. Its shape can then be changed into digital form and can be transmitted as a program to the machine tools. In this manner, the necessary templates, tools, parts, and components of the aircraft come into being. Each result is controlled by numerical measuring instruments."

Is this information in response to the questions at the beginning of the chapter? Yes, it is only in this way that the automation of design work can produce actual effects. It is a way of avoiding errors, saving time, increasing accuracy, optimizing parameters, increasing materials savings. The final results--increased quality of the final product.

"However, automation does not come on its own; the organization of development, technical preparation, and production itself had to be changed. Only in this way will a really new aircraft come into being."

Under the leadership of the chief designer, Hero of Socialist Labor, Eng Vlastimil Mertl, the employees of the design bureau at the Let Kunovice Plant overcame ingrained concepts regarding their own work and habitual methods of thinking. The predominant majority of designers today is fully conversant with programming and continue in their studies.

"The automation of design is a giant qualitative change," says Eng J. Balsik. "People frequently ask where everything here came from. It sometimes seems strange to them when we say that we created everything ourselves, with our own brains, with our own hands. These are the results of the initiative and hard work on the part of our people. And with all this we must respond to the question about ourselves--what will come next? Even here, the answer is clear. To further increase knowledge and qualifications. We do not see any other possibility if we intend to hold our ground in the future."

Live Initiative

Speaking on the way to the assembly line, Eng Josef Burstik says: "Where live initiative comes from and what it actually is could be most readily described as follows: True live initiative is found everywhere where people want to master a task, come what may. Toward this end, what is essentially needed is enthusiasm, specialized knowledge must not be lacking, desire and appetite for work must not be lacking, mix a few drops of anger or pain if things cannot move.... This is all brought out by life itself. Things get mixed up; people have to see to the availability of investments and materials and then the initiative will actually bring results."

In this manner, virtually all comprehensive rationalization brigades come into being in the Let Kunovice Plant.

"At first, we were suffering from the effort that we wanted to have brigades at any price. Today, they come into being here out of the needs of people

themselves who solve specific tasks. A brigade comes into being with the task and is abolished when the task is solved."

At the beginning of 1986, there were 30 comprehensive rationalization brigades at the plant. At the end of the year--there was precisely one-half that number. More were not needed. However, the missions of the brigades are best shown by their actual work.

One of them is concerned with the construction, equipment, and future operation of two large warehouses at the enterprise. Another has the character of an international brigade because it cooperates with specialists from the GDR and is endeavoring to lower the noise levels within the new aircraft.

"Where the new warehouses will be, they have just begun with the earth-moving operations," Eng Burstik reminds us, "but they are already working on programs which will direct the work of the warehouses. We are certain that this is balanced with respect to proportions: to begin with the foundations of the construction and with the creation of the control program virtually at the same time. After all, what true item comes into being from one day to the next?"

As far as the acoustics of the interior of the new aircraft are concerned, it is one of those tasks which appears to be unsolvable at first glance. Noise within the aircraft cannot be reduced by strengthening the walls of the fuselage and linings or panelings of various materials do not help. The solution must be completely original because the task is defined as follows: to reach the lowest noise level with the minimum addition of mass. So, the employees of the Let Plant met with brigade specialists from the Institute of Thermodynamics of the Czechoslovak Academy of Sciences in Prague, with employees of the State Research Institute for Machine Construction at Bechovice, with employees from the Motorlet and Avia aircraft plants and from the Center of Aviation Medicine, as well as with specialists from the GDR, to share in the development of a new carbon fiber.

Are not too many forces concentrated in two brigades? Definitely not. These are problems which are considered to be red hot within the enterprise. What tasks will fall to the brigades when these problems are mastered? One thing is already certain today: things will not be easy in the future either.

On the Assembly Line

In the middle of a spacious assembly shop a wingless and tailless fuselage of an aircraft will show up one day on a special pedestal. Today, it is still the tried and proven L-410 UVP-E. During its first assembly stop, the fuselage is filled with entire kilometers of electrical cables; at the next stop the fuselage is placed on the wheels of the actual undercarriage. Another move along the assembly line provides the aircraft with wings and with the tail assembly. Individual connections are made, the engines, the flaps of the wings, and the tail assembly come alive. The electric wiring is energized, hydraulic fluid is inserted into hydraulic systems. There still has to be an endless number of checks and, finally, the solemn moment. The

gates of the assembly building stand wide open and the shining aircraft rolls out. But still not under the strength of its own engines. It is only when it is outside that the engines vibrate the entire design for a few moments and the aircraft is moved--to the showers. For 3 hours, it is sprayed with streams of water. It is only water which clearly shows even the smallest leak.

Much of what can be seen today on the assembly line will disappear from the assembly shops and new things will appear. A riveting machine which has rivet compensation facilities has already begun to operate. Specifically, this means that the rivet completely fills the opening and, thus, in actual fact acts as a bolt. This increases strength and aircraft life, reduces vibration, and thus also noise.... Today, special clamping cranes are still in crates, but new measuring instruments are appearing on the floor.

So, the new aircraft is gradually taking shape on the horizon of production. One day it will actually fly. Then, it will be measured during test flights which may not exceed more than 10 hours. Otherwise, it would not be a good aircraft. It will be tested by being subjected to deep frosts, as well as high heat. It will fly through the wonderful blue quiet sky just as it will fly through fog and storm clouds.

Will it pass the tests? Certainly. A modern aircraft comes into being only as a result of precise calculations and through the use of excellent materials, but primarily as a result of patient work, as a result of the skill and care of people. They are the ones who will equip it with everything necessary for a good journey.

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NEW CZECHOSLOVAK C-2 SATELLITE FOR INTERKOSMOS PROGRAM

Prague LETECTVI A KOSMONAUTIKA in Czech No 7, 1987 pp 20-21

[Article by engineer Vojtech Velicky and Jarsolav Vojta, Geophysical CSAV (Czechoslovak Academy of Sciences) Institute, Prague: "The Mechanical Construction of the new CSSR Subsatellite C-2"]

[Text] The successful experiment with the first Czechoslovak satellite Magion launched together with Interkosmos 18, which took place in 1978-81, showed the advantages of taking measurements in two satellites which are orbiting on practically the same path. The use of two objects with the same orbital parameters makes it possible, when measuring natural phenomena, to differentiate between spatial and time variations, impossible to achieve when only one satellite is taking measurements. Furthermore, it is possible for the subsatellite to record signal travel and other secondary effects caused by the equipment on board of the main satellite. By utilizing these opportunities the experiment reaches a qualitatively higher level.

In the course of planning further scientific experiments within the Interkosmos program, the CSSR was requested to develop a new subsatellite for use in these experiments. The development and coordination was entrusted to the Geophysical Institute of the CSAV. Presently, the subsatellite is to be used in four satellite experiments from 1988 to 1990.

The "Interbol" project consists of two satellite experiments. During the first experiment it is expected that the satellite will be launched into an orbit with an apogee of 25,000 km. The second satellite has a very extravagant orbit with an apogee of 200,000 km. In both experiments a subsatellite will be used with the same orbital parameters. The distance between the two satellites is supposed to be elective in the range from 100 km to 10,000 km. Both the satellite and subsatellite will be stabilized by rotation with a rotation axis oriented to the sun.

The "Active" (Aktivnyj) project will have the satellite and subsatellite on a low path with an apogee of 2500 km. The main satellite will have a three axis stabilization to the earth and speed vector, the axis of the subsatellite will be oriented along the line of force of the earth's magnetic field. The distance between the two objects in the course of taking measurements will be between 100 m and 100 km.

The "Apex" project is similar to this experiment except that the planned apogee is supposed to be 3500 km.

On account of the scientific objectives of these four experiments, technical requirements for the mechanical construction, basic (operation) equipment and for scientific instruments were established.

In this article, we will deal only with the technical requirements for the mechanical construction. The equipment and testing will be discussed later in a separate article.

Above all, it was necessary to first create one uniform basic construction of the subsatellite skeleton for all four experiments. This would ensure the usability of the uniform subsatellite type.

Secondly, our team had to create a basic construction of lowest possible weight and thus the deliberations resulted in the weight of the skeleton being 10 kg and the entire subsatellite 40 to 50 kg. Of course, the lightness of the subsatellite must not have a negative effect on the requirements placed on the strength of the subsatellite which must pass vibration and falling tests.

Compared to the low weight requirement, the next requirement is totally different. It is to ensure a good thermal conductivity of the skeleton which is necessary for the creation of an optimum thermal system of the entire subsatellite, mainly in the case of an orientation to the sun, when only one side is constantly heated by the sun.

Furthermore, the skeleton must have grasping points for the handling as well as transporting of the subsatellite.

The high reliability of all mechanisms, the effects of vacuum, weightlessness, effects of vibrations and overloading during launching, the center of balance and other conditions connected with the activity of individual scientific instruments, require minimal use of magnetic materials in the skeleton, conductivity of the surface of all internal parts, limiting radiation effects, etc. These are only a few of the requirements that we have to take into consideration for the construction of the subsatellite's skeleton. In addition, it is necessary to ensure the possibility of changing individual parts of the instruments and finally to secure the electrical connection of all of the subsatellite's systems.

The basic dimensions of the subsatellite are limited by the space available on the carrying rockets or by the place where it is attached to the main satellite. Finally, the most suitable solution was a rounded shape with 26 sides and places to attach extending arms.

Regarding the electrical energy consumption and the way the subsatellite orients itself, it is necessary to determine the amount, size and distribution of the sun battery panels.

Because of the limited space inside the satellite and because the sensitive sensors need to be as far from the subsatellite as possible, the sensors are located on 6 extendable arms. Because of lack of space some sun cell panels are also extendable.

The entire construction of the subsatellite is designed as a self-supporting skeleton made of sheet metal. The base is formed by 4 carrying angles a connected by crosspieces and stabilizers. Between the carrying angles, 4 platforms hold the plates which hold printed connections of the electronic parts of the subsatellite's equipment. The plates are in tracks in the walls of the carrying angles. Underneath these plates is a connection grate. All plates are secured by a spring which also dampens against the launching vibrations. Some of the operation equipment (receivers, transmitters and voltage transformers) are located in the middle of the space between the carrying angles. In the top and bottom of these angles are spaces for placing sensors of the scientific instruments and technical connectors. The heaviest parts - the pressure gas container, valves and other parts of the engine, orbit correction, chemical batteries and separating mechanism - are attached to the inside and to the bottom of the subsatellite's skeleton. The top part of the skeleton has the carrying rod with extendable arms attached to it. The carrying angles, all reinforcements and handles are made as light as possible and they are strengthened by bends and stampings. The surface of the entire construction is strengthened by stamped sheet metal cover which at the same time improves the thermal conductivity of the entire object and secures the optimum temperature regime of the sun battery panels.

The basic material of the subsatellite's skeleton is a sheet metal 1 mm thick made of aluminum alloys, rolled while cold, stamped on both sides with pure aluminum (CSSR standard no CSN 42 7306, material no 42 4253). Only the bottom carrying frame is made of material which is 1.5 mm thick.

In addition to the external sheet metal cover, the parts manufactured from aluminum alloy sheet metal have a surface processed by heat pickling. After the pickling, the surface of the sheet metal pure and slightly dull in appearance. The external surface of the sheet metal cover is polished and underneath the sun panels it is painted.

All parts of the subsatellite are screwed together and secured against loosening. The final design of the actual subsatellite calls for connecting individual parts by gluing and riveting them.

After testing its mechanical properties, the model of the subsatellite was manufactured at the Geophysical Institute at the CSAV.

In the next stage, testing of the subsatellite model was conducted in order to evaluate the strength and behavior of this model during prescribed vibration and falling tests. The substantial parts of the operation equipment were replaced for the purpose of this test by weight dummies, thus the mass of the model was 23 kg. The testing was carried out at the state enterprise Technometra Strasnice. In the vibration tests, the equipment type VP-85 from Derritron was used. In the falling tests, the equipment type

3.16.02 from VEB Telton was used. The vibration tests took place in three perpendicular axis according to the following program:

10- 30 Hz	1,2 g	1--logarithmic change of the frequency 0.5 okt/min
30-100 Hz	4 g	
100-300 Hz	5 g	
300-600 Hz	8 g	2--logarithmic change of the frequency 0.33 okt/min
600-1200 Hz	10 g	
1200-2400 Hz	12 g	

The duration of the vibrations was 3 minutes after each subrange.

During the testing of blows, the model underwent 25 blows on each axis with a load of 40 g at an impulse length of T = 1 ms.

In the course of the vibration testing, resonance of the rectangle shaped external sheet metal cover was detected in the range between 110 and 150 Hz. In the frequency range of 300 Hz, resonance of the triangle shape sheet metal cover was detected. In addition, in the course of side axis vibrations, the resonance of the carrying magnetometer rod was detected in the frequency range of 45 Hz. The resonances did not cause a significant amplitude frequency increase of the resonating part and in terms of the skeleton's strength they can be ignored. The testing did not reveal any damage to the equipment and the blow testing showed no damages as well.

The results proved the suitability of the construction design. The resonance of some parts will be eliminated in the next stage by suitable construction adjustments. On the basis of these evaluating tests, the detailed designing of individual parts of the subsatellite can continue.

The technical description of the design of the mechanical part of our new satellite will soon be elaborated upon by information in a single article.

Captions:

1--Three heads of the Active experiment - from the left: engineers Pavel Triska, CSC, Vojtech Velicky and Jaroslav Vojta during testing of the subsatellite S-2

2--One of the basic stamped construction part of the skeleton

3--The bottom of the KDU engine - in the middle a reduction valve, around it stirring valves and on the sides two of the four jets

4--The technological model was also tested for the reliability of the energy system - the sun battery; to the right a sun simulator

5--The KDU reaction correction engine was designed in the USSR for the S-2 satellite using parts manufactured in series; the fuel media is dried pressurized air; the dark cylindrical part on the bottom is a spring separating mechanism attaching the subsatellite to the main satellite

6-8--Skeletons - the primary carrying subsatellite construction of the Active, Apex and Interbol experiments was manufactured by skilled workers at the Kunovicky Let; two of the jets of the correction engine will be installed on the extending arms carrier.

12993/9835
CSO: 2402/30

DEVELOPMENT OF BIOTECHNOLOGY IN CEMA COUNTRIES

East Berlin TECHNISCHE GEMEINSCHAFT in German No 5, 1987 p 24

[Article by Petko Teuchert: "Biotechnology in CEMA on the Advance"]

[Text] Soviet geneticists have succeeded in extracting entire plants on a mass level from individual cells of different varieties of grain. Member of USSR Academy of Sciences Aleksey Sozinov reported at a press conference at the Vavilov General Genetics Institute in Moscow, which he directs, on a new step in human knowledge.

Molecular biology, genetic manipulation, genetic engineering, restrictases as "genetic scissors," and ligases as "needle and thread," with which life forms distantly positioned on the evolutionary ladder are linked and previously unsurmountable interspecific barriers between microorganisms, plants and animals are being broken down, are creating extensive opportunities for agriculture and pharmaceuticals. Constantly self-reproducing raw materials and energy sources, as well as the effective mining of natural deposits, are opening up.

From traditional human activities, such as the production of bread, cheese and yogurt, the pressing of wine and the making of silage, has emerged a modern branch of the economy and of production. In the coming years, it will play a significant role in scientific and technical progress. It is not merely chance that biotechnology is one of the five priority directions in the CEMA complex program for scientific and technical progress.

The biotechnological potential created by the CEMA countries in the few years since the birth of genetic engineering is considerable. In the Byelorussian city of Mozyr, a yeast fodder plant (a CEMA project) is in production in which liquid paraffins resulting from petroleum refining are processed into protein. The technological foundations were developed jointly by the USSR and the GDR. The CSSR, Cuba and Poland were involved in the construction. With a million tons of yeast fodder a year, the USSR is the world leader in protein production using biotechnological methods. Research and development programs are under way in the CEMA countries, either separately or in tune with other member states. By 1990, for example, the production of biotechnological products in the GDR is to have increased threefold compared to 1985. Significant capacities have been created in Berlin. The Research Center for

Biotechnology and the Dessau Zymology VEB are preparing to introduce the lysine synthesis process to production, which makes it possible to save fodder in agriculture.

The socialist countries are working energetically on using biotechnology to obtain antibiotics for human and veterinary medicine. Thus, Mongolia has already developed around one dozen preparations. Bulgaria occupies a leading position in animal antibiotics. The CSSR has a great deal of experience in the production of protein from wood and cellulose, and Romania is coordinating projects on extracting oil and copper using biotechnological methods.

Bacteria in League with Legumes

In research institutes in the USSR, Bulgaria, the GDR, the CSSR, Cuba, Hungary and Poland, work is currently under way on intensifying the symbiosis of bacteria and legumes, which produces nitrogen and improves soil. Within the CEMA, work in this area is being coordinated by the Pushchino Institute for Biochemistry and Physiology of Microorganisms. It is now a question of using genetic engineering to create bacterial strains that produce more nitrogen, or rather enter into an artificial symbiosis with grain and other cultivated plants. This is all the more enticing since a great deal of energy and natural gas is currently expended throughout the world in order to produce 50 million tons of nitrogen fertilizer.

As a result of the application of biotechnological methods, new forms of agriculturally useful plants are emerging that are resistant to disease and pests, drought and heat, herbicides and soil salinization. We have already seen the first generation of genetic structures that when injected into a genome can bring about the emergence of a new quality of protein and a new function in a plant cell. If, for example, the gene of a certain type of bacteria is injected into tobacco chromosomes, the plants are protected against damage by caterpillars and beetle larvae. There are plans to use genetic engineering to change the composition of amino acid in the protein of grasses in order to improve the quality of the plant protein by increasing the percentage of non-replaceable amino acids.

Photosynthesis Can Be Made Even More Effective

The injection of genes into chromosomes that provide safe protection of agricultural plants against fully active herbicides could qualitatively change the technology of plant cultivation. After the first stage of applying genetic engineering through the injection of a single gene into plant chromosomes, the second generation of genetic structures will follow in the not-so-distant future. These structures will determine how effective biosynthesis must be in the propagation cells of various compounds that are used in medicine and pharmaceuticals, for example. It is also highly likely that it will be possible to increase the effectiveness of photosynthesis processes in the plant cell and to solve the problem of fixating atmospheric nitrogen.

New Opportunities in Environmental Protection

Finally, in the third stage, genetic structures will be developed that not only increase the productivity of the cultivated forms of plants, but also make is possible to utilize the wild forms that are adapted to extreme developmental conditions. The realization of all the projects should contribute to a rise in the effectiveness of agricultural production, more optimal land utilization, a drastic decrease in energy consumption per agricultural production unit and a considerable reduction in pollution from plant protectives and pesticides as well as fertilizers.

If one considers how multifarious plants are and how complicated the genotype of each individual variety of plant is, then one sees how extensive the scope of work is. One need merely mention that a plant organism exists, develops and multiplies through the interaction of at least 10,000 different genes.

At present, it is quite possible to use the effective methods of classical genetics and of its new direction--genetic engineering--in order to solve problems as difficult as changing the plant genotype. In capitalist industrial countries, a sharp increase in activities in this area can be noted, not only in university laboratories, but also in the labs of prominent transnational organizations. They buy out seed cultivation companies, massively strengthen or create new departments for plant genetic engineering and invest billions of dollars in their development. In the socialist countries, energetic measures are needed in order to keep pace with solving these tasks. The implementation of the CEMA complex program is the way to do this.

Powers of Nature Used for Industry

The Pushchino research center, at which scientists from other CEMA countries also work, is located 100 kilometers south of Moscow. It is creating the foundation for the industrial use of the powers of nature through the extraction of yeast fodder from liquid paraffins, for example, whereby 20 million tons of fodder grain have already been replaced in the USSR alone. The success of the institute in exploring the symbiosis of bacteroides with legumes is evidenced by the fact that mutants of the bacteria have been created through which the soybean yield could be increased by 10 percent.

12271
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INSTITUTE DIRECTOR DISCUSSES GENE MANIPULATION

Prague TECHNICKY TYDENIK in Czech No 9, 24 Feb 87 pp 1-2

[Interview with Dr Eng Karel Sebesta, doctor of sciences, director of the Institute of Organic Chemistry and Biochemistry of the Czechoslovak Academy of Sciences, by Blanka Brablecova: "The First Czechoslovak Synthesis of Genes"; date and place not given]

[Text] Recently, we have been recording the rapid development of the organic chemistry of living matter. Together with the development of biochemistry, this has become a knowledge and methodology base for many biological sciences which has made it possible to uncover the essence and mechanisms of important functions of living organisms on the molecular level. The principal contribution of bio-organic chemistry and biochemistry--apart from discovering new physiologically active substances--is the fact that they have created a base for the development of gene manipulation. The task of developing long-term directions for the control of gene manipulation in cellular and molecular biology is currently part of the long-term goals of the technical policy of the CPCZ.

[Question] Which directions will the research in organic chemistry and biochemistry take and what does this discipline mean in terms of the expansion of Czechoslovak science in general?--this is the first question asked of the director of the Institute of Organic Chemistry and Biochemistry of the Czechoslovak Academy of Sciences, Dr Eng Karel Sebesta, doctor of sciences.

[Answer] In organic and bio-organic chemistry and in many aspects of biochemistry, Czechoslovak science enjoys an internationally recognized position. This makes it possible to solve relationships between the chemical structure and biological effectiveness of natural substances and their analogs at a contemporary world level. The objective of this research is to deliberately intervene in life activities, to obtain new theoretical and practical findings. These then make it possible to further solve problems of physiology, genetics, and pharmacology on a molecular level and they also facilitate special scientific disciplines such as entomology, etc.

[Question] And in social practice?

[Answer] They find application in new medicines, in new diagnostic procedures, in means for increasing livestock and plant production, as well as in items which become manifest in the effective protection of the environment. The results of research in bio-organic chemistry and in biochemistry will continue to be determinant with respect to the development of biotechnology and, particularly, of genetic engineering. One of the most valuable results of the past period can be considered to be the first Czechoslovak synthesis of genes which we accomplished in cooperation with the Institute of Molecular Genetics of the Czechoslovak Academy of Sciences. Our share consisted in the design of an original instrument for semiautomatic synthesis and in the chemical preparation of the fundamental blocks of which the gene is composed.

[Question] You also achieved significant successes in solving additional tasks involved in basic research....

[Answer] Briefly stated: these were new purely theoretical findings obtained regarding the course of elimination reactions which will make it possible to control their progress deliberately. Theoretical work also includes results of investigations pertaining to the uneven structure of the amide group, the key building block of basic components of the organism--peptides and proteins. A decisive step forward was accomplished in the isolation, determination of the structure, synthesis, and establishment of the relationship between the structure and function pertaining to basic components of living matter. This is particularly true of peptides, components of nucleic acids, content substances of insects, secondary plant metabolites, and high molecular compounds, proteins, and enzymes.

[Question] Have these found application in practice or not?

[Answer] Naturally, however in comprehensive cooperation with other work sites engaged in research and production. I now have in mind, for example, the veterinary peptide medicine called "Depotocin," feromonic traps used to combat the pine bark beetle and the apple tree borer, chicken pepsin as a replacement rennet substance. This part also includes the introduction of new economic methods for the preparation of peptide medicine through synthesis in the solid phase and the introduction of biotechnological production of L-aspartic acid.

It should be stressed that these outputs are only representative of broader cooperation with the pharmaceuticals industry, with the production of modern means to combat harmful insects, and cooperation with the qualified chemistry industry in general. In other words, we are dealing with cooperation which is not limited merely to the handing over of results, but also involves additional aspects of relationships between basic research and production, including raising the qualifications of workers. This category includes indirectly even the first synthesis of a gene in Czechoslovakia and the design of the first fully automatic gene synthesizer in the countries of the socialist community of nations.

[Question] The need for research and practice to cooperate is evident. Nevertheless, there seems to be insufficient interest in many a demonstrably suitable result of research. Why is that?

[Answer] I shall address only the experiences of our institute. The development of new forms of cooperation allows us to transmit into practice the predominant majority of intended outputs, even within an acceptable time frame. This does not mean that everything always goes absolutely smoothly. In some cases, for example, in introducing the production of the peptide sweetening agent Usal, long delays are being encountered, probably as a result of inefficient cooperation between individual components of the realization sphere.

Consequently, I consider the failure to solve economic relationships between basic research and users to be a persistent shortcoming. These relationships do not facilitate the necessary material stimulation of workers, nor do they make it possible to replace essential material costs without disrupting fulfillment of the basic research task. This fact, naturally, sharply contrasts with the importance which we place upon transmitting scientific results into practice, as well as with the fact that we are one of the last socialist countries which has, thus far, not found a solution to this problem. It is a paradox that these economic relationships--even though they might be an exception--are satisfactorily solved by our advanced schools.

[Question] The principal content of the activities of your institute is precisely responsive to the requirements levied upon the chemical sciences by the document of the 17th Congress of the CPCZ: to clarify the relationship between the structure and character of substances and to thus create a scientific basis for the rationalization of the preparation and application of new materials in production sectors. What details can you provide in this respect, comrade director?

[Answer] In all the listed activities, we shall be concerned with solving problems and with creating the necessary lead time in the level of basic research. In other words, not only shall we be concerned with replacing applied research. A special chapter in our work will then be formed by our contacts with practice. It is based on the traditions dating back to the very inception of our institute and is based on three basic principles: to provide practice with the results of basic research, to help production partners create qualified cadres capable of accepting and finalizing the results of basic research, and to select or create administratively demanding forms of cooperation which can even produce essential material contributions to the institute. However, given the current administrative and legal situation, this latter point is solved only with particular difficulty.

Of the good contacts with production, I must emphasize the exemplary contacts with the pharmaceuticals industry. This is documented by the production of medicines and biorational pesticides, which has ranked Czechoslovakia in first place among the socialist countries. And so that scientific and research work in the form of realizational outputs would be accelerated, our institute has created a joint laboratory of the Institute of Organic Chemistry and Biochemistry of the Czechoslovak Academy of Sciences and the State Institute for the Control of Medicines on the basis of an agreement concluded between the Czechoslovak Academy of Sciences and the ministries of health of the Czech Socialist Republic and the Slovak Socialist Republic.

In other words--they are doing everything here to see to it that the results of work transposed into practice are of the maximum utility for our entire socialist society.

5911
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HUNGARY: PHYSICS RESEARCH INSTITUTE BUYS COM SYSTEM FROM AGFA

Budapest NEPSZABADSAG in Hungarian 20 Feb 87 p 6

[Interview with Endre Juhacsek, Scientific Secretary of the KFKI (Central Research Institute of Physics) of the MTA (Hungarian Academy of Sciences), Gyorgy Kelemen, Chief of Main Department at the Datorg Foreign Data Processing and Organizing Corp. (Datorg Kulkereskedelmi Adatfeldolgozo es Szervezo Rt.), and Csaba Diosdi, Computer Plant Manager at Volan Elektronika by Magos Katalin]

[Endre Juhacsek] We would not have thought that it would be easier to replace at full value a computer which cannot be shipped to socialist countries, because of the embargo, with a computer made by the KFKI, and thus to establish a reference system and an economic corporation in a "marriage" with the Agfa microfilm system, than it would be to change the attitude that clings to mountains of paper which are difficult to process and which waste space and materials.

Truckloads of Files

[Juhacsek] It is impossible to understand why Hungarian enterprises continue to choose this outdated and expensive method when COM (Computer Output Microfilm) systems, developed a decade ago for directly microfilming computer processed data, are today a justly popular and indispensable feature of the world's great computer centers.

You see, if it isn't "minute by minute" information that is needed, then, for technological and financial reasons, a choice is often made (and in Hungary tendency is even stronger because of the lack of telephone lines) in favor of systems in which the processing and the utilization are separated in space and time. Machines connected to the telephone network also need to obtain the data in hard copy form. Regular computer users all over the world were quick to recognize that microfilm output is much cheaper than paper, which slows down the work. In Hungary, on the other hand, there is a great deal of resistance; a lot of people seem to be afraid that COM's would take their desks away.

This film sheet in my hand, smaller than a standard envelope, contains as much information as 270 leporellos (that is, 270 A3 sheets used in paper

printers), which means that it can give us a 98 percent saving in space: information which otherwise would require a truckload of paper can now be contained in a few file folders. For example, the personal data relating to the population of our country could be stored in a single desk by this method.

Savings of More Than 8 Million Forints

[Question] How much does all this cost?

[Juhacsek] If, for example, microfilm is used to replace 5 million A3 leporellos, then (assuming recording in duplicate) we can save the national economy more than 8 million forints in material imports. The data can be retrieved at any time by means of a desktop reader which is designed for the purpose and can currently be bought for less than 20,000 forints. We would like to manufacture the Agfa desktop reader in Hungary if we can find a partner.

[Question] How did the Agfa and KFKI equipment lines find each other?

[Gyorgy Kelemen] In 1984, taking account of the rapid spread of computers in our country and the international trend (for example, there were already more than 150 COM systems operating in Austria), it seemed logical that the demand for microfilm data recording would soon grow by a quantum jump in Hungary as well. But this demand cannot be met by the Hungarian system, which has three first generations and is struggling with a lack of components. For this reason, we decided that we would expand our existing services by using COM's.

We selected the Agfa system after a comprehensive market survey. One of the factors in its favor was that they offered to let us use their microfilm equipment free of charge for a one year trial, and only after that would we have to decide whether to purchase it. Furthermore, the Vienna representatives of Agfa assured us that any defects that were found would be quickly corrected by them at our plants. There was only one problem: the American-made computer necessary for this system could not be shipped because of the embargo. Therefore it was decided that they would look for a suitable Hungarian machine as a substitute for it.

After this, things happened quickly. It was a year and a half ago that the Agfa representative approached the KFKI. The TPA-11,440 machine made by the people at the Institute was able to "negotiate the barrier successfully": it has been operating for over a year quite reliably, at the technological level required by the Agfa equipment. In early 1986 an economic corporation was formed, with the participation of Datorg, Volan Elektronika, and the KFKI, to establish a COM plant. And last September the reference system also began operation.

[Question] Are you going to buy the microfilm printer even though there is little demand at the moment for the services of the COM plant?

[Kelemen] We are not sending it back; in fact, for the sake of greater safety, we are planning to purchase and start up a second system, so that we can

maintain a 24 hour preparation time even in the case of a technical breakdown when the order is sufficiently large. Even though the majority of the 1,200 enterprises surveyed at the time when the plant went into operation continued to use paper for data recording, there are already some encouraging signs. First of all, some foreign-trade enterprises have converted to microfilm recording. This is not surprising: on the capitalist market nowadays anyone who sends out data printed on leporellos is not regarded as a serious trading partner. We are holding discussions with enterprises in transportation, industrial enterprises, and TEK's [Capital Equipment Enterprises], as well as state administered institutions. In the case of TEK's, for example, we could easily put together a fresh list of items every month. At present, because of the long printing run, this is undertaken only once a year, so we cannot call this up-to-date at all.

One Step Behind in the Overall View

The largest user today is Volan Elektronika, the third member of the economic corporation. Csaba Diosdi, Computer Plant Manager, has this to say about microfilm data storage:

[Csaba Diosdi] We use computers to handle all of the business dealings of the Volan enterprises: bills of lading, truck drivers' wages, bus schedules, major repairs signaled by our technical information system, and so on. We spent about 20 million forints a year for the preparation of the leporellos, not to mention the problems associated with transportation and storage. We decided in favor of microfilming for economic reasons. At first we thought about buying an independent system, but in January of last year, when we met the Datorg representative at the Agfa exhibition, we found that joining the proposed economic corporation was a better solution.

[Question] Did the Volan enterprises agree quickly to the conversion?

[Diosdi] No, as a matter of fact, even today we still have not succeeded in reaching an agreement with every one of them. There are some who still insist on using paper. This is partly because of an earlier experiment of ours which was not entirely successful. We already tried microfilm data recording a few years ago, but at that time, because of defects in the supply of components under the Hungarian system, we did not receive the processed data until it was too late, whereas what we need is a continuous flow of information. Our messengers traveling on a regular schedule to and from the county seats bring the necessary data there and back every day, because it is more reliable than telephoning. Other users who become members of the economic corporation may also take advantage of this service of ours.

As can be seen from this case, among others, the overall view is often one step behind the possibilities. So we should not always rail at technology if there is a delay in receiving a reply to inquiries about our problems from the council or from a public utility or if the conduct of business at our enterprises is slow.

13285
CSO: 2502/42

HUNGARY: NEW COMPUTER, CAD SOFTWARE FROM VIDEOTON

Budapest NEPSZAVA in Hungarian 27 Feb 87 p 4

[Report on Interview with Gaspar Stark, Chief of Main Department at Videoton, Mrs Jozsef Urik, Electrical Engineer, and Istvan Szombati, Development Engineer, by Pal Molnar: "Videoton Computing--Software-Package Plans"]

[Text] The screen shows a drawing of the house in three views: front, side, and top. The computer operator makes a sharper line appear on the screen and cuts the diagram diagonally in half with it. "How many degrees shall I turn it?" he asks. "152," comes the answer. The engineer strikes the keys to type the three digits, and the drawing disappears from the screen. New lines appear, then more and more of them, and finally the complete cross section of the house, rotated in space, becomes visible on the screen. "If necessary, I'll color the wall surfaces, to make it easier to visualize," says the technical specialist, and shades of blue, white, and red jump into place all over the drawing. This method is known as CAD, meaning "computer aided design." It represents one of the possible uses of a new product made by Videoton: a high performance, multistation microcomputer, for which programs are now being prepared at the enterprise's development institute.

Brain Concentration

[Gaspar Stark] "We have a high 'brain concentration' here. Out of 80 members of the main department for software development, 65 have advanced degrees, that is, there are 65 who are electrical engineers or programming mathematicians. They are putting together `basic software systems' for the computers of this enterprise, which is headquartered in Szekesfehervar."

"For our work, it isn't enough to know computer technology; knowledge from several specialized areas must be blended into each basic program," says the technical specialist, who holds two academic degrees. "Therefore we solve our problems by using extended cooperation. In one of the jobs now in progress we're collaborating with Finnish firms. We're designing a system for planning piping networks. The planning of piping networks by the conventional method involves a great deal of work, and there are lots of opportunities for making mistakes. Many mistakes become apparent only at the time of fabrication, and by then it would take a great deal of expense to correct them. Computer aided design prevents these mistakes: for example, it makes it impossible for

different pipes to collide at one level. Our system will be useful primarily for designing atomic power stations, chemical plants, and ships."

The specialist tells us that another demanding job they do is the making of software that is suitable for mechanical engineering design, more specifically for the development of drive motors. With the program package to be developed in collaboration with the Technical University for Heavy Industry, in Miskolc, our computer system will be capable of helping designers in many tasks, from kinematic sketches to component drawings. At the Institute in Huvosvolgy they expect this cooperation to result in "products that can be sold on any market." An important part of this work is that they also produce what is called NC output, that is, programs for controlling production which is suitable for numerically controlled machinery. Thus their output will be suitable for handling CAM tasks, that is, computer aided manufacturing.

They are also making program packages for the design of plastic working tools, single family houses, and electronic subassemblies, the last of these with the collaboration of the SZKI (Computer Technology Coordinating Institute). In addition, they are also working at the enterprise to supplement the computer system itself: among other things, they are developing "tablets," suitable for the input of graphical information, and plotters, that is, computer equipped drawing boards.

[Stark] "In this category, there are already computers operating in the West that know much more than this. On the CEMA market our product is regarded as high level advanced equipment, whereas in the West it is only average."

Finnish and French Markets

As my informant tells me, it is hard to compete with large firms, which have extensive distribution and service networks and which market their wares at low prices. Nevertheless, there is a good chance that their new product, supplemented with some imports, will be saleable on the capitalist market as well.

[Question] "How do the software developers sense that they are in competition?"

[Stark] "'We work on French and Finnish orders too, so that we face their type of requirements every day, and we satisfy them. We sense a harsher competition not with regard to our products but with regard to the workers...."

It becomes clear from Gaspar Stark's words that workers can be lured away by smaller producing organizations and by the possibility of working abroad. Today there is high demand for software specialists on the Hungarian labor market, and they are eagerly welcomed by foreign firms, primarily in Austria and West Germany.

There seem to be two methods likely to keep workers from leaving. One is to create a good atmosphere in the workplace, and the other is to pay them an income commensurate with their work.

As far as the atmosphere in the workplace is concerned, only modern forms of relationship can be effective. There can be no question, for example, of forcing someone to do a job through commands or directions; in fact, as the Chief of Main Department says, for effective solutions, you must win the worker's full agreement. And this is by no means easy.

Talking about earlier examples brings up the case of a specialist in charge of a smaller working group. They were working out an operational system for maintenance and development. This exceptionally capable man built numerous new ideas into the work, many of them brilliant, but he did not inform his colleagues about them. Thus cooperation became impossible. Recognizing this, after a period of waiting patiently, they offered him assignments suitable for an individual working alone. He did not accept them and left for another job. Another high performance specialist, also a man of splendid abilities, was unable for a long time to complete his development work because he kept trying to work out newer and better versions. They sent him away for a study tour on a fellowship.

[Mrs Jozsef Urik] "It would be wrong to say that those who work in computing technology are people who behave oddly. The same conditions prevail here as in any other line of work. In any case, today's tasks are not very much to the taste of solitary geniuses; results can be achieved mostly by group work."

'A Demo Version'

In one of the computer rooms of the Videoton Institute in Huvosvolgy work is progressing quietly. Development engineer Istvan Szombati readily presents what he calls "a demo version," that is, the demonstration part of a design program, on the color monitor. He says that he doesn't want to try his luck elsewhere and is able tc get along well as he is.

[Istvan Szombati] "In addition to my salary, I can also get income from patent rights and from work I do in the VGM (enterprise workers' association). Many development problems are too much for the eight hour day, and we solve these in the VGM. Taking everything together, a software expert who works hard can get a monthly income of over 10,000 forints."

There are numbers even bigger than 10,000 appearing in the table displayed on the desktop monitor. Then at the push of a button the column of figures disappears and new green glowing lines are typed out, one below the other. All their knowledge, all the racking of their brains will pay off, for after all, as the members of the Institute emphasize, here they are not working just to have it "filed and forgotten."

13285
CSO 2502/41

CZECHOSLOVAK-POLISH COOPERATION IN ELECTRONICS

Prague TECHNICKY TYDENIK in Czech No 9, 24 Feb 87 p 9

[Article by Eng Rudolf Sorm, candidate of sciences, director of the Tesla Research Institute for Communications Technology imeni A.S. Popov in Prague: "Greater Series, Fewer Costs"]

[Text] Scientific-technical cooperation in the area of electronics between Czechoslovak and Polish research institutes and producing enterprises has a long tradition. As early as the 1960's and at the beginning of the 1970's it is possible to note successful cooperation between the institutes and enterprises in the development of production of electronic tubes, basic types of semiconductor elements (diodes and transistors), luminescent diodes, and semiconductor materials. During the 2d half of the 1970's and in 1980 there occurred a certain stagnation or rather a limitation of mutual relationships.

It wasn't until 1984/1985 that an express revival of mutual cooperation in the area of the component base of electronics between the Tesla electronics components concern in Czechoslovakia and the Unitra-Cemi Enterprise in Poland was noted. Cooperation between research institutes and developmental units of enterprises within the framework of the semiconductor experts group began to develop with great success. On the basis of agreements between the directors of Tesla-VUST and ITE Warsaw, an agreement covering the exchange of scientific-technical information was concluded and initiated in 1984 with respect to the development of new components for the most immediate period, the development of program components for the automated IO VLSI proposal, the development of new technologies, the development of possible partial technological operations, etc. Agreement was reached on the inclusion of 10 highly topical and beneficial topics, followed by specialists from the Design and Technology Group, directed in this country by the microelectronics sector of the Tesla Research Institute for Communications Technology imeni A.S. Popov and, in Poland, by the microelectronics unit of ITE Warsaw.

The scientific-technical work of this group is actively participated in by the developmental work site of Tesla at Roznov and Tesla at Piestany on our side and by employees of CEMI on the Polish side.

Since 1984, specialists from the above-named work sites have established closer contacts in solving specific problems. During the course of 1986, for

example, there were two meetings of the Design and Technology Group and eight consultations of specialists cooperating in the organization of topical themes.

At the last meeting of the group, both sides exchanged information on topical development plans for the period of the 8th Five-Year Plan and with respect to the types of circuits which it was impossible to include in the plan for reasons of capacity. The offer of the Polish side to specialize the IO on pulse telephone dialing, with possibilities of possible modernization according to the requirements of our side, was discussed. Other sectors proposed for specialization are circuits for frequency synthesis, frequency telephone dialing, microprocessors, and microcomputers. During the course of the 8th Five-Year Plan it is possible to anticipate a higher share in the division of labor involved in the creation of the component base, particularly in the area of circuits for capital and consumer electronics in the 8th and 9th Five-Year Plan.

A relatively broad assortment was developed by both sides in recent years with respect to microwave semiconductor components which were, very likely, not profitable for inclusion in the production of both countries with regard to the relatively small size of the series. Therefore, it was an important task to prepare agreements on the specialization of production which would free up development capacity to solve other tasks involved in the development of microwave integrated circuits.

In December 1985, an agreement on scientific-technical cooperation in solving the problem "Materials for Optical Electronics, Microelectronics, and Microwave Technology" was signed between the Tesla-VUST and the Unitra-CEMAT (ITME) in Warsaw. As a part of this agreement, an outline program of cooperation for the period 1986 through 1990 was set forth, particularly aimed at the development technologies for the preparation of monocrystals and epitaxial structures, semiconductor AIIIBV combinations, and methods for controlling monocrystal and epitaxial structures of these solutions.

Apart from the standard forms of cooperation, scientific-technical consultations, and exchanges of samples, it is anticipated that reciprocal assignments of specialists of both sides with direct participation in solving specific problems will emerge as a new form of cooperation.

During the course of the first consultations, samples of substrates for optical electronics elements were handed over, as were samples of microwave semiconductor components. The Polish side made available samples of bipolar transistors, cascade diodes, and prospectus of several technological installations. Narrow areas of mutual interest were identified in analytic and diagnostic methods for semiconductor materials, in the technology of the growth of epitaxial layers, in the area of housings for semiconductor components, and in the exchange of opinions with regard to the conditions of the specialization of production. Simultaneously, an outline proposal of the plan for cooperation covering the years 1986 through 1990 was compiled.

In January 1986, five priority tasks were selected which were under the direct control of leading central organs for science and technology of Poland and

Czechoslovakia; included among these tasks is the task "Materials for Electronics, Optical Electronics, and Microwave Technology." In realizing these tasks it was decided to make priority use of higher forms of cooperation. The production of dust-free chemicals is being prepared, as is that of highly purified metals and alloys, conductive and resistive pastes for silk-screen printing are being developed, photoresistor materials are being developed, as are pure gases for microelectronics and other materials.

Both sides are developing efforts to make the transition from the nonbinding exchange of information toward contractual solutions with clearly specified obligations for both sides and calling for the handing over of attained results for a fee.

5911
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HEAT TREATMENT STRATEGIES, PERSPECTIVES

Budapest FINOMMECHANIKA-MIKROTECHNIKA in Hungarian No 1, Jan 87 pp 3, 5-6

[Article by Miklos Fried, MTA (Hungarian Academy of Sciences), KFKI (Central Research Institute of Physics), MKI (Microelectronics Research Institute)]

[Excerpts] In this article we give a survey of nonconventional (rapid and pulsed) heat treatment methods and of their advantages and disadvantages. We show that some of their properties open new areas of application for research and development. Without making any claim to completeness, we use examples from the technical literature to demonstrate the applications possibilities.

A Special Rapid Heat Treatment Method: Rapid Thermal Annealing (RTA)

In what follows, we shall concern ourselves with rapid heat treatment in the narrow sense. By an RTA we mean a heat treatment which uses an essentially incoherent source of light, applied at the same time over the entire surface and lasting less than 100 sec At present we have no direct information as to whether RTA is used in industry. But the fact that a number of firms that manufacture technological equipment are already selling RTA equipment to be used on an IC assembly line is an indication that its use is becoming more and more widespread.

An experimental apparatus, prepared by Gyula Meszaros, already exists in the KFKI. The eight 1 kW halogen lamps in this device are capable of heating a silicon slice to the melting point in a protective gas. The heat treatment cycle can be programmed by means of a ZX81 personal computer. It is also possible to set up a multistep heat treatment, lasting up to 60 sec at increments of 0.1 sec. At present, in addition to the heat treatment of silicon after implantation, there are also plans for the production of metal silicides (primarily titanium silicide).

In what follows, we shall illustrate the possibilities of RTA, using the example of the heat treatment of semiconductor compounds which are still entirely in the research and development stage. The heat treatment of these materials is a much more touchy question than that of silicon, since their surfaces decompose easily. For this reason, in the usual furnace heat

treatment the slice must be provided with a protective layer (for example silicon oxinitride). When RTA is used, this becomes unnecessary in many cases (Fig. 5).

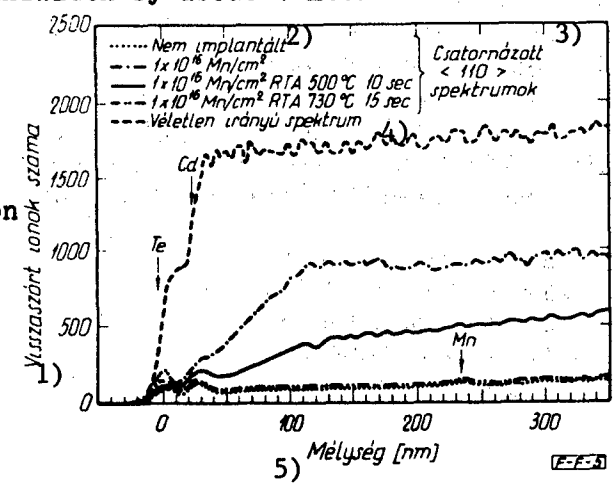
Figure 4 shows the possibilities of heat treatment of GaAs after implantation. It can be seen from the figure that the situation is made more complicated than that of silicon because there is a sharp separation between recrystallization and electrical activation (at about 200°C). The reason for this is that GaAs is a compound. The figure also makes it clear that the curve of the electrical activation limit lies at a higher temperature everywhere than that of the decomposition of the surface, although in the region of RTA it is much closer than in the region of furnace treatment. In addition, the most important advantage of using RTA, now as before, is that the displacement of the contamination profile can be disregarded.

In Fig. 5 we see an example of a new method for using RTA in the preparation of "semimagnetic semiconductors". Up to now such materials were produced with molecular beam epitaxis by growing a layer of appropriate composition, having special properties, onto the surface of a single-crystal II-VI semiconductor. In the case of $Cd_{1-x}Mn_xTe$, which occurs in our example as well, the bandwidth and the effective mass vary as a function of x (that is to say, as a function of the Mn content). Furthermore, in the case of a variation in the external magnetic field, due to the magnetic ion (the manganese) and the variation in temperature, there will be a large variation in the bandwidth and a number of interesting magnetic properties will be observable. However, their production by the conventional method is limited by the thermodynamic conditions. When ion implantation and RTA are used, it appears that a wider range of these materials will be usable.

The method is illustrated by Fig 5. Cadmium telluride was implanted with a dose of 10^{16} Mn/cm^2, at an energy of 60 keV. The ion backscattering spectra, combined with the channel effect, show the effect of the implantation and the two different heat treatments. The implanted Mn and the resulting lattice damage are found in the top layer, which is 100 nm thick. Heat treatment even at 500°C substantially reduced the lattice damage, but treatment at 730°C made it disappear completely. This dose corresponds to a 2 percent Mn content. According to the measurements, at a temperature of 10 K the effect of a magnetic field of 1 tesla changed the bandwidth by about 1 meV.

Figure 5

1) Number of backscattered ions
2) Not implanted
3) Channeled <110> spectra
4) Spectrum with an accidental direction
5) Depth [nm]



13285
CSO: 2502/48

ELECTRICAL PARAMETERS OF RECRYSTALLIZED POLYSILICON STRUCTURES HEAT-TREATED BY HALOGEN LAMP

Budapest FINOMMECHANIKA-MIKROTECHNIKA in Hungarian No 1, Jan 87 pp 7, 16

[Article by Peter Barna, Mrs. Antal Adam, Jozsef Gyulai, Tibor Mohacsy, Szvetlana Sandor, and Mrs. Robert Schiller (KFKI [Central Research Institute of Physics]) and J. Banisch and H. Tillack (IHP Frankfurt/O)]

[Excerpts] The authors produced metal gate CMOS transistors in recrystallized polysilicon layers by means of halogen lamps. In order to determine the properties of the SOI instruments, they carried out the same technological operations in a parallel manner on a single-crystal silicon slice. The measurements of the currents under V_1, n, p, V_{bd} , V_1 indicate that the characteristics of the CMOS transistors made from the recrystallized slices are not inferior to those of the elements made from the reference slices. The lower mobility and output of the SOI transistors may be attributed to particles in the recrystallized layer which measure several m.

Conclusions

It is worth while to work with recrystallized silicon thin layers in SOI systems. On the basis of the first few experiments we conducted, this appears to be a promising technology. However, the low outputs indicate that we must still make a thorough study of the mechanism of the formation of the particle system formed in the recrystallizing layer, the internal structure of the SOI, and the exact choice of the heat treatment conditions.

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HUNGARY: ION MIXING PROCESS, APPLICATIONS

Budapest FINOMMECHANIKA-MIKROTECHNIKA in Hungarian No 1, Jan 87 pp 17, 19-21

[Article by Erika Jaroli and Gabor Mezei, KFKI (Central Research Institute of Physics)]

[Excerpts] By ion mixing we mean a procedure in which we mix thin layers with a high energy ion beam.

In its first part the article gives an outline of the mechanism of ion mixing and its dependence on experimental conditions, after which it mentions some possible applications. In the second part it summarizes the research results achieved in this field on the Hungarian scene.

Hungarian Results

It is important to mention the results achieved under Hungarian conditions, using Hungarian equipment and instruments. These experiments were begun in 1984, during the acceleration test run of the NIK [Heavy Ion Cascade], which was developed at the KFKI. At present the equipment is capable of routinely accelerating singly and doubly charged noble gas ions and hydrogen ions with a voltage of 100 to 400 kV.

The Hungarian experiments include, on the one hand, applied research aimed at working out new technologies and, on the other hand, basic research whose purpose is to create new metastable phases and to examine and explain the elementary processes that take place. The systems examined thus far have been metal-semiconductor dual layers.

As a first step, we examined the mixing of the Ni-Ge two-layer system under the action of both thermal heat treatment and ion beam treatment (Xe^{++} at 700 keV, Ar^{+} at 300 keV) [17]. The specimens were prepared by vaporization onto SiO_2, and the Ge layer thickness was about 100 nm. We found for both methods that the first phase to appear (which can be demonstrated by nitrogen diffraction) is Ni_2Ge. After heat treatment at a temperature as low as 200°C for 20 min this compound phase was already demonstrable; when the temperature was increased, all of the Ni and Ge reacted and we were able to demonstrate final phases of NiGe, Ni_2Ge, and Ni_3Ge. In the case of ion beams, a dose of 10^{16} ions/cm^2 had to be used in order to obtain a substantial amount of

mixing, but the mixing was not complete even with this dose. The demonstrated phase is Ni_2Ge in this case also. This result shows the significance of the chemical motive force, since in both cases the most easily formed phase was the first to appear [17].

The next step was the examination of the system consisting of GaAs and about 50 nm of Au. In the formation of metal-semiconductor contacts a problem is caused by the fact that the resulting boundary layer is not uniform and growths from the alloying metal invade the basic material, which significantly impairs the electrical behavior of the device [18]. We examined this phenomenon and tried to eliminate it in the GaAs/Au system, working in collaboration with the Technological Physics Research Institute. For the ion mixing of the boundary layer we used 400 keV Ar^+ and 700 keV Xe^{++}. In order to avoid excessive destruction, it was considered desirable to use low dose implantation (10^{14} ions per cm^2), followed by heat treatment. The results obtained by thermal treatment alone and by ion beam treatment followed by thermal treatment were completely different from each other.

When thermal heat treatment was used alone, a significant reaction began only after 10 min of heat treatment at 475°C, but under these conditions the Au uncontrollably invaded the GaAs. The results are presented in Fig. 3, which shows the RBS (Rutherford Backscattering Spectrometry) spectra. The meaning of such simple RBS diagrams is very easy to see in the figure. The arrows marked with the names of the elements indicate on the spectrum the quantity associated with the marked element surface, while as we move toward lower channel numbers, the spectrum corresponds to a concentration depth profile. It can be seen that the specimen without heat treatment has only gold on its surface, since the edge of the GaAs has not reached the arrowed channel corresponding to it. Heat treatment at 450°C for 10 min still produced no substantial mixing, although in this case the gold layer contained 10 percent Ga. Complete mixing was produced only by heat treatment at 475°C for 10 min, but in this case the gold had penetrated too deeply into the GaAs, and its concentration was also highly variable as a function of depth. (The gold had penetrated so deeply that there was considerable overlapping between the two spectra.)

When the heat treatments were preceded by 700 keV irradiation, the mixing reaction was complete after 10 min of heat treatment at a temperature as low as 400°C, and the layer produced was uniform and homogeneous. Figure 4 illustrates this case. The RBS spectrum taken immediately after implantation did not differ from the one for the unimplanted specimen, which shows that there was no very significant mixing on the boundary surface. On the other hand, when ion backscattering measurements were used in combination with the channel effect, the destructive effect of the Xe was demonstrable. (In these cases we take the spectrum in such a way that the direction of the beam will coincide with the main crystallographic direction of the single-crystal mass, which in this case is the GaAs. The reason is that in this case the yield of the spectrum is substantially reduced by the "channeling" of the ions. By this process it can be shown just how badly the implanted layer has been destroyed, because the site of the destruction exhibits a hump representing an increase in yield.) In our case we show such oriented spectra in Fig. 5, comparing them with the corresponding unoriented RBS spectra. In the spectrum marked

with an X the destruction is shown by the small hump in the GaAs. This destroyed layer grows back epitaxically after heat treatment at 500°C for 5 min, since the oriented and unoriented spectra of the specimen are parallel to each other after the portion that is mixed with gold.

Fig. 3. RBS spectra of the heat treated GaAs/Au system
Key:
1) Impact number
2) Without heat treatment
3) Channel number
4) Edge
5) Minute

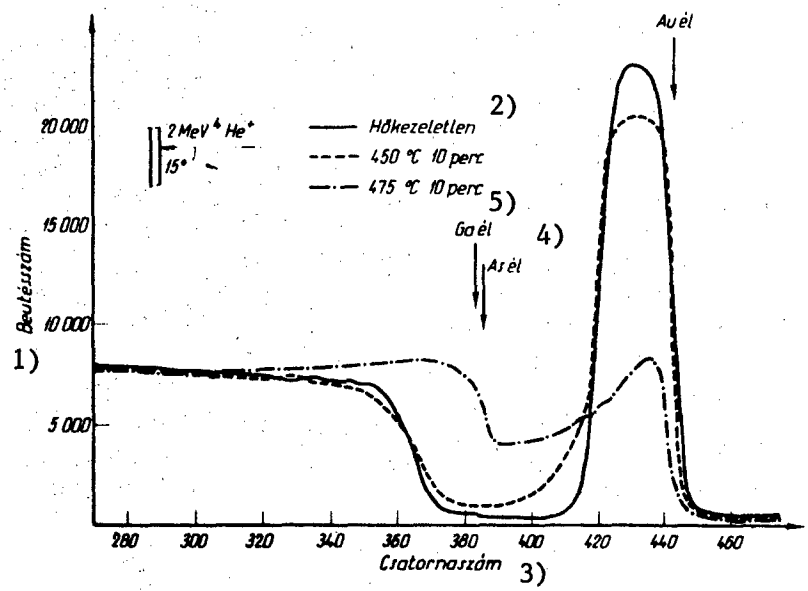


Fig. 4. Results (RBS spectra) of heat treatment of a GaAs/Au system irradiated with 10^{14} 700 keV Xe^{++} ions/cm^2.
Key:
1) Impact number
2) After implantation
3) Channel number
4) Edge
5) Minute

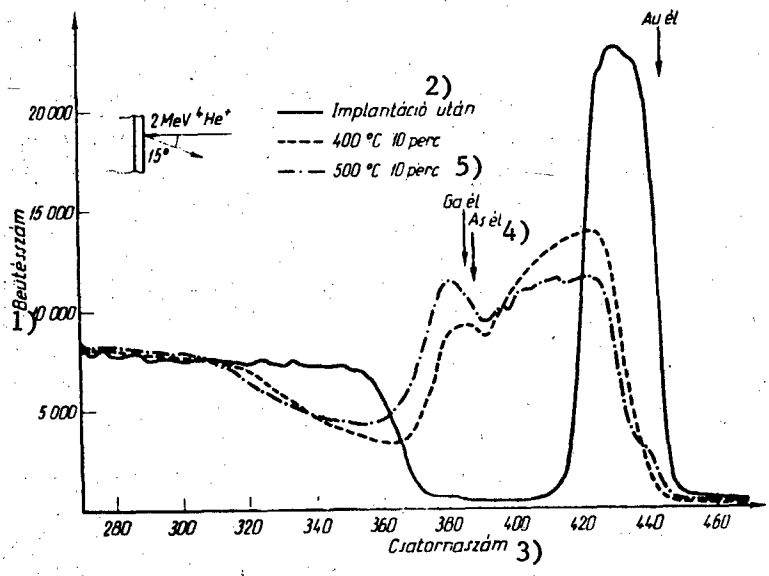
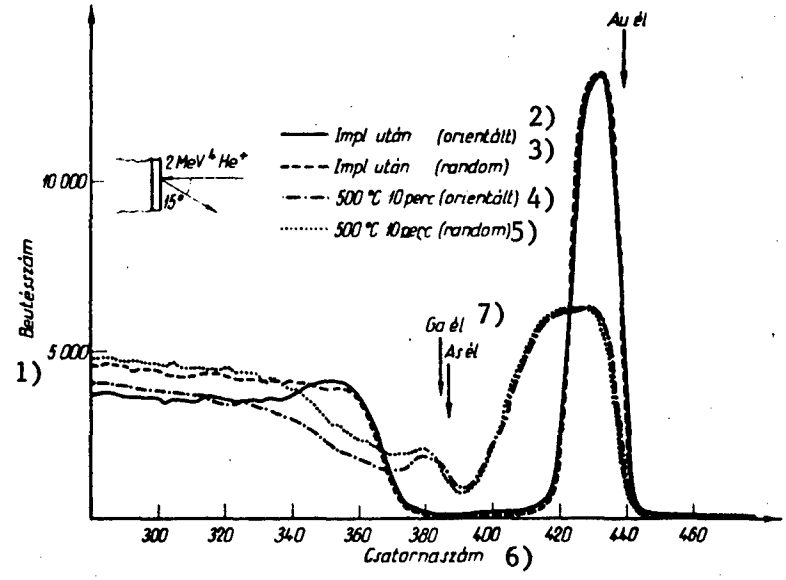


Fig. 5. Recrystallization: Comparison of the oriented and the RBS spectra in a GaAs/Au system irradiated with 10^{14} 700 keV Xe^{++} ions/cm^2.
Key:
1) Impact number
2) After implantation (oriented)
3) After implantation (random)
4) 500°C, 10 min (oriented)
5) 500°C, 10 min (random)
6) Channel number
7) Edge



Returning to the RBS spectra of implanted and subsequently heat treated specimens, shown in Fig. 4, we see that complete mixing is produced by 10 min of heat treatment at a temperature as low as 400°C, and the mixed layer is much more uniform than after heat treatment alone at 475°C for 10 min. After implantation, even heat treatment at 500°C for 10 min does not make the gold penetrate further; in fact, the concentration of gold in the part near the surface becomes higher (after 10 min at 400°C the gold content in this area is 34 atomic percent, and after 10 min at 500°C it is 44 atomic percent).

It was surprising that bombardment with 400 keV Ar^+ ions, in a dose of 2 x 10^{14} ions/cm^2, inhibits the mixing produced by subsequent heat treatment (Fig.

6) [sic]. The probable reason for this is that the Ar is more mobile, it coheres in the form of bubbles, and this inhibits the fusion.

Summarizing the results, we found that after ion bombardment with appropriate parameters, the threshold temperature for contact formation is reduced and the uniformity of the boundary layer is better than in the case of conventional heat treatment. It is also important that after implantation heat treatment at even higher temperatures did not make the gold diffuse further into the interior [19]. We are planning to examine in the near future the electrical properties of the contact so formed.

13285
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APPLICATION OF PLASMA ACCELERATE LAYER SEPARATING METHODS

Budapest FINOMMECHANIKA-MIKROTECHNIKA in Hungarian No 1, Jan 87 p 22

[Article by Istvan Szendro, MEV (Microelectronics Enterprise)]

[Excerpt] Using examples, the author presents the advantages of plasma enhanced layer deposition technology. By presenting this process, which can be used in many ways, he hopes to promote its wider use in Hungary.

Through a number of separate examples, our article gives an idea of some widely divergent areas of work in industry and at research institutions which utilize the advantages of plasma enhanced chemical vapor deposition (PECVD) and which have already been widely used in industry or may be expected to be used in the near future. Another purpose is to engage the attention of developers working in the most diverse fields of industry and institutional research and arouse their interest in the application of PECVD processes and the development and use of such equipment. We consider this important because, as far as we know, there are only three PECVD apparatuses for industrial use in Hungary (two at the KFKI and one at the MUFI [Technical Physics Research Institute], the apparatus at the MEV having been dismantled recently), and we feel that this represents too small a number and too narrow a field of application.

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BRIEFS

MEETING OF HUNGARIAN SEMICONDUCTOR GROUP--On 19 May 1986, the semiconductor Physics Special Group of the Lorand Eotvos Physics Society held a one day symposium under the title of "Rapid Heat Treatment and Plasma Deposition Methods in Semiconductor Technology." The communications in this issue of our journal contain the material of the lectures presented at that symposium. The articles present the physical and chemical foundations of the technological steps concerned, the modalities of their industrial realization, and the present trends in research and development activity. The communications also discuss interesting experimental results recently obtained in Hungarian research laboratories. Those readers who are interested in more specific details of these areas, which are developing in a dynamic and, at the same time, diversified manner, will find an abundant bibliography in most of the articles. [Excerpt] [Budapest FINOMMECHANIKA-MIKROTECHNIKA in Hungarian No 1, Jan 87 p 1] 13285

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